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ABSTRACT

This document provides students, parents, educators, administrators, policy makers, and the public with a set of common guidelines for environmental education. These voluntary guidelines are intended to aid state and local efforts to provide quality environmental education. The guidelines suggest expectations for learner performance and achievement in grades K-4, 5-8, and 9-12; foster the development of effective and comprehensive environmental education programs and curricula; point the way toward using environmental education as a means for meeting the standards set by the traditional disciplines and providing students with opportunities to synthesize knowledge and experience across disciplines; and provide a common understanding of the aims of environmental education to ground collaborative educational efforts. (Appendices contain an annotated list of resources that informed the Guidelines.) (CCM)

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ED 436 346

Excellence in Environmental Education -- Guidelines for Learning (K-12)

--Final Review Draft--
March 1998

J.C. Hidelberg

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North American Association for Environmental Education

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Excellence in Environmental Education -- Guidelines for Learning (K-12) is the fifth in a series of documents published by NAAEE as part of the National Project for Excellence in Environmental Education. The Project has committed to synthesize the best thinking about environmental education through an extensive process of review and discussion. Thus far, thousands of individuals and organizations representing all aspects of education and environmental education have reviewed working outlines and drafts. They include teachers, educational administrators, environmental scientists, curriculum developers, staff from natural resource agencies and education departments, and people from many other areas of expertise.

The publications of the Excellence in Environmental Education project include:

1) The NAAEE Standards Project: Papers on the Development of Environmental Education Standards (1995), working documents that provided the basic background research for the project.
2) Environmental Education Materials: Guidelines for Excellence (1996), a set of recommendations for developing and selecting environmental education materials.
3) The Environmental Education Collection -- A Review of Resources for Educators, Vol. I (1997), a resource guide designed to help educators find curricula, multimedia resources, and other educational materials that can enhance teaching environmental education in a variety of settings.
4) The Environmental Education Collection -- A Review of Resources for Educators, Vol 2 (1998).
5) Excellence in Environmental Education -- Guidelines for Learning (K-12), guidance for fostering and gauging environmental literacy in kindergarten through twelfth grade (Final publication in 1998 anticipated).
6) Environmental Education Guidelines for Excellence: Initial Preparation of Educators, a set of recommendations for the preparation of teachers and other environmental education practitioners. (1998 publication anticipated)

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INTRODUCTION

Excellence in Environmental Education -- Guidelines for Learning (K-12) provides students, parents, educators, administrators, policy makers, and the public a set of common guidelines for environmental education. These voluntary guidelines are intended to inform state and local efforts to provide quality education. The guidelines:

- £ Suggest expectations for learner performance and achievement in kindergarten through fourth, fifth through eighth, and ninth through twelfth grades;

- £ Foster the development of effective and comprehensive environmental education programs and curricula;

- £ Point the way toward using environmental education as a means for meeting the standards set by the traditional disciplines and providing students with opportunities to synthesize knowledge and experience across disciplines;

- £ Provide a common understanding of the aims of environmental education to ground collaborative educational efforts.

Environmental education is a lifelong process firmly rooted in the education of school-age children. Young people develop a foundation of skills, knowledge, and dispositions that they build on as they take on the responsibilities of adulthood and citizenship. The decisions that these young people will make and shape as community members, leaders, employees, heads of families, and individuals will shape the future. Their ability to choose wisely and shape a world marked by sustained and shared environmental quality and quality of life depends in large part on what they learn now.

Cultivating the environmental literacy that can ground wise and informed decisions neither begins nor ends with formal education, nor does it end with high school graduation. But schools do play a major role. These *Guidelines* provide a standard for high-quality environmental education in schools across the country. They draw on the field's best thinking to outline the core ingredients for environmental education, based on what an environmentally literate person should know and be able to do.

Environmental Education: A Vision for the Future

The *Guidelines* are grounded in a common understanding of effective environmental education. For many environmental educators, that understanding is rooted in two

founding documents of the field: the Belgrade Charter (UNESCO-UNEP, 1976) and the Tbilisi Declaration (UNESCO, 1978).

The Belgrade Charter was adopted by a United Nations conference and provides a widely accepted goal statement for environmental education:

> The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

A few years later, at the world's first intergovernmental conference on environmental education, the Tbilisi Declaration was adopted. This declaration built on the Belgrade Charter and established three broad objectives for environmental education. These objectives provide the foundation for much of what has been done in the field since 1978:

> To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
>
> To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
>
> To create new patterns of behavior of individuals, groups and society as a whole towards the environment.

As the field has evolved, these principles have been researched, critiqued, revisited, and expanded. They still stand as a strong foundation for a shared view of the core concepts and skills that environmentally literate citizens need. Since 1978, bodies such as the Brundtland Commission (Brundtland, 1987) the United Nations Conference on Environment and Development in Rio (UNCED, 1992), and the U.S. President's Council on Sustainable Development have influenced the work of many environmental educators, highlighting the importance of viewing the environment within the context of human influences. This perspective has expanded the emphasis of environmental education by focusing more attention on social equity, economics, culture, and political structure.

Essential Underpinnings of Environmental Education

Environmental education is motivated by an underlying belief that humans are capable of living compatibly with nature, acting equitably toward each other and future generations, and making informed and forward-thinking decisions. In planting the seeds of lifelong learning, environmental education envisions and promotes a society peopled by effective and environmentally literate citizens who are capable of and inclined toward democratic participation, cooperation, creativity, and responsibility.

Here are some important elements of environmental education's "world view" that shape its approach to education:

Systems - Environmental education uses the idea of systems to help make sense of a large and complex world. A system has parts that can be understood separately, but the whole cannot be understood without understanding the relationships among its parts. The human body can be understood as a system, so can galaxies. Organizations, individual cells, communities of animals and plants, and families can all be understood as systems. And, of course, systems can be nested within other systems.

Interdependence - Environmental education works from the understanding that human well-being is inextricably bound with environmental quality. Humans are a part of the natural order. We and the systems we create -- our societies, politics, economics, cultural activities, technologies -- have a large impact on the systems and cycles of the rest of nature. Since we are "in" the system, a part of nature rather than outside it, we are challenged to recognize the ramifications of our interdependence.

The importance of where one lives - Environmental education begins close to home, encouraging learners to forge connections with, explore, and understand their immediate surroundings. The sensitivity, knowledge, and skills needed for this local connection provide a base for moving out into larger systems, broader issues, and an expanding understanding of causes, connections, and consequences.

Integration and infusion - Environmental education draws on and integrates knowledge from disciplines that span the natural sciences, social sciences, and humanities. It connects their different ways of understanding through the medium of the environment and environmental issues. Rather than being a separate discipline or subject area, environmental education offers opportunities for integration and works best when infused across the curriculum.

Roots in the real world - Environmental education engages learners in investigation, analysis, and problem-solving the process of gaining knowledge and skills through direct experience. It challenges learners to build and apply their skills and knowledge in

the changing, uncertain "real world" of the environment, society, and environmental issues.

Learning for life - Environmental education emphasizes critical and creative thinking, decision making, and communication, as well as collaborative learning. These skills are essential for learning that is a meaningful and active pursuit, both in school and over a lifetime.

Teaching from the Guidelines

Excellence in Environmental Education -- Guidelines for Learning (K-12) is primarily focused on student achievement. These guidelines suggest the rough outlines of an instructional vision, which is taken up in more detail in two of the other documents in the series, *Environmental Education Materials: Guidelines for Excellence* (1996) and *Environmental Education Guidelines for Excellence: Initial Preparation of Instructors* (forthcoming). Although this is a document about learning rather than instruction, the two are so closely linked that it is appropriate to suggest a handful of points that are central to implementing environmental education in the classroom.

Environmental education treats the learner as an active participant, both in and outside the classroom and other formal learning experiences. If learning is going to become a natural, valued part of life beyond school, instruction should be guided by the student's interests and treated as a process of building knowledge and skills. The *Guidelines* offer a general framework for that process, sequenced in accordance with other disciplinary standards. It is the instructor's knowledge of individual learners and different classes that will enable the instructor to adapt the framework to specific settings, making environmental education relevant to specific learners at particular developmental levels.

Environmental education is built on a foundation of understanding the environment and related issues, but it also encompasses skills and personal commitment to apply both skills and knowledge to help ensure environmental quality. Instruction should provide opportunities for learners to enhance their capacity for independent thinking and effective, responsible action. Engaging in individual and group work helps learners develop these capacities independently and in collaborative situations that anticipate the ways in which problem-solving happens in the community, on the job, and in the family. A strong emphasis on developing communication skills means that learners will be able both to demonstrate and to apply their knowledge.

Because environmental issues can prompt deep feelings and strong opinions, environmental educators must take a balanced approach to instruction. Educators must incorporate differing perspectives and points of view even-handedly and respectfully,

and present information with intellectual honesty. Fairness and accuracy are watchwords for instruction.

Environmental literacy depends on a personal commitment to apply both skills and knowledge to help ensure environmental quality and quality of life. For most learners, that personal commitment begins with an awareness of what is around them in their local environment and community. As much as environmental education is driven by inquiry, reasoning, and problem-solving skills, it is also, like art, driven by passion and connection with the world. That passion and connection grounds conceptual knowledge and motivates students to become learners. Instructors should provide learners with early and continuing opportunities to explore their environment, "taking the show on the road" or at least out of the classroom to engage students in direct discovery of the world around them.

Organizing Themes for the Guidelines

Excellence in Environmental Education -- Guidelines for Learning (K-12) works from a vision of linking environmental education with formal education in a way that makes educational sense and promotes progress toward sustaining and sharing a healthy environment and quality of life around the world. The guidelines are organized under four themes that reflect the breadth of environmental education and its goal of environmental literacy.

Theme #1: Questioning and analysis skills

Developing environmental literacy depends on learners' willingness and ability to ask questions about the world around them, speculate and hypothesize, seek information, and develop answers to their questions. Environmental literacy requires a familiarity with some basic modes of inquiry, a mastery of fundamental skills for gathering and organizing information, and an ability to interpret and synthesize information and develop explanations.

Theme #2: Knowledge of environmental processes and systems

An important building block in the foundation of environmental literacy is an understanding of the processes and systems that comprise the environment, including human systems and their influences. That understanding is based on knowledge synthesized from across the traditional disciplines. The guidelines under this theme are grouped in four sub-themes: #2A) The Earth as a physical system; #2B) The living environment; #2C) Humans and their societies; and #2D) Environment and society.

Theme #3: Skills for understanding and addressing environmental issues

Learners apply and refine their skills and knowledge in the context of environmental issues. These environmental issues are real-life dramas where differing viewpoints about the underlying environmental problems and their potential solutions are played out. Environmental literacy includes the abilities to learn about, evaluate, and act on environmental issues. The guidelines under this themes are grouped in three sub-themes: #3A) Skills for analyzing environmental issues; #3B) Skills for investigating environmental issues; and #3C) Decision-making and citizenship skills.

Theme #4: Personal and civic responsibility

Environmentally literate citizens are motivated and empowered to act on their own conclusions about what should be done to ensure environmental quality. As learners develop and apply concept-based learnings and skills for inquiry, analysis, and action, they cultivate an understanding that what they do as individuals and in groups can make a difference. Environmental literacy is activated by individual commitment.

How to Use the Guidelines

Excellence in Environmental Education -- Guidelines for Learning (K-12) sets forth the broad goal of environmental literacy. It is an ambitious goal, but one that can be achieved, recognizing that environmental literacy is a lifelong process and that learners' capacity for understanding and competency varies for many reasons.

As was noted earlier in the introduction, the *Guidelines* are intended to serve multiple purposes. The description below offers insight into how the *Guidelines* are designed to fulfill these specific purposes.

A Comprehensive Vision for Environmental Education

Useful for...

- Shaping or evaluating environmental education programs.
- Synthesizing learner knowledge and experience across disciplines.
- Understanding the aims of environmental education.

The *Guidelines* encompass a whole vision of environmental education and environmental literacy that provides a context for particular environmental education efforts. This vision is encapsulated in the introduction and given breadth and depth in the details of the guidelines themselves. It is a comprehensive vision, but also

developmental. The *Guidelines* differentiate among learners in kindergarten through fourth grades, fifth through eighth grades, and ninth through twelfth grades. They suggest realistic expectations for these grade levels.

A measured dose of ambition and realism is recommended when applying this vision to a particular program or curriculum. It is better to do parts well than to attempt to cover the whole vision superficially. At the same time, keep in mind how elegantly environmental education can help fit parts of the curriculum into a meaningful whole. Integration is not only possible, but rewarding and in keeping with the general direction of education today. A high-quality, comprehensive environmental education program helps schools and instructors meet their goals for overall instructional effectiveness.

Learner Guidelines for Different Grade Levels

Useful for...

- Gauging learner performance and achievement.
- Shaping or evaluating environmental education programs.

At the heart of *Excellence in Environmental Education* are the guidelines themselves. The guidelines suggest appropriate expectations for learner performance and achievement in kindergarten through fourth grades, fifth through eighth grades, and ninth through twelfth grades. They are organized in four broad thematic areas. Within each of the themes, several guidelines suggest general goals for learner achievement. Finally, each guideline is accompanied by a few performance measures that serve as examples of how learner achievement might be demonstrated.

Examples for the Classroom

Useful for...

- Improving instruction.
- Shaping environmental education programs.

The text is accompanied by brief examples that illustrate classroom techniques for meeting the guidelines and suggest additional performance measures. The examples draw real classroom experience into the guidelines. In addition, for each of the three grade levels K-4, 5-8, and 9-12 an extended case study illustrates how instructors might "put it all together," incorporating the themes suggested in the guidelines into classroom experiences. [*These examples and cases studies will be included in the final draft.]*

Connections with Other Disciplinary Standards

Useful for...

- Using environmental education to meet the traditional disciplinary standards.
- Synthesizing learner knowledge and experience across disciplines.
- Shaping or evaluating environmental education programs.

The *Guidelines* draw from the national standards set by other disciplines including the arts, civics and government, economics, geography, history, mathematics, science, and social studies. To the side of each guideline, where appropriate, are listed references to particular pages in the disciplinary standards. These pages contain standards, performance objectives, and examples that are related to the environmental education guideline. The publications in which these disciplinary standards appear are listed in the "Resources" section at the end of this document [*This listing will be included in the final draft*].

Additional Resources

Useful for...

- Understanding the aims of environmental education.
- Shaping or evaluating environmental education programs.

A "Resources" section that lists works referenced in this document and suggests resources and readings in several categories related to the guidelines will be included in the final draft. In addition, a concluding section on "Antecedents to the Development of the Learner Guidelines Framework," relates some key developments in the field of environmental education to the thematic framework around which the guidelines are structured.

Guidelines for Kindergarten through Fourth Grades

Theme #1
Questioning and Analysis Skills

Guidelines

a) Questioning -- Learners develop questions that can ground learning about the environment and simple investigations.

- Generate ideas and questions about objects, organisms, events, places, and relationships in the environment.
- Identify questions they are likely to be able to answer by combining their own observations and investigations of the environment with existing information.
- Pose questions based on experiences in their own community and local environment as well as from media presentations about environmental phenomena and other places.

Science 122-123
Geography 42-43, 46-47
Mathematics 23-25
English Language Arts 38-39

b) Designing investigations -- Learners are able to design simple investigations.

- Speculate about possible answers to their questions, developing and discussing alternative explanations.
- Design ways of answering questions based on systematic observations. For example, devise a way to learn about the life cycle of a caterpillar or the means of transportation that children take to and from their school.
- Design simple experiments to answer questions and test ideas they have about the environment.

Science 148

c) Evaluating credibility -- Students understand the need to judge the merits of the information they are using. They are familiar with some of the factors to consider in making those judgments.

- Explain some of the reasons why sources of information vary in their credibility.
- Provide specific examples of information they believe to be factual, fictitious, or of questionable merit and explain their reasoning.
- Analyze some of the factors that might influence the credibility of a specific source of information, considering for example, its creator, possible reasons for bias, and how the information was created (methods, use of evidence, etc.).

History 67-68
Science 143, 148
Mathematics 75-80

d) Collecting information -- Learners are able to locate and collect information about the environment and environmental topics from a variety of sources in a variety of ways.

- Note characteristics, differences, and change in objects, organisms, events, places, and relationships in the environment.
- Make and record systematic observations about the physical and human characteristics of places.
- Find, assess, select, and use resources such as atlases, data bases, charts, graphs, and maps.
- Use basic field skills, such as interviewing, to collect information.
- Use tools such as rulers, thermometers, watches, scales, magnifiers, and microscopes to conduct observations. Use computers and calculators to conduct investigations and work with information.

Geography 49-50, 144-145
Science 145
Mathematics 116-119
History 67-68
Social Studies 35
English Language Arts 27-29, 38-41

e) ***Organizing information*** -- Learners are able to describe data and organize information to show relationships and patterns concerning the environment and environmental topics.

- Identify regularities in events, designs, organisms, and sets of numbers.
- Represent and describe mathematical relationships and use those relationships as a way of organizing data. For example, chart the relationship between plant growth and growing conditions that vary according to the amount of water or sunlight.
- Summarize observations and describe data.
- Construct, read, and interpret maps, graphs, tables, diagrams, and other displays of data.

Mathematics 54-56, 60-62
Geography 47, 107-107
English Language Arts 35-36

f) ***Working with models and simulations*** -- Learners can relate physical patterns and processes to their more abstract or conceptual underpinnings.

- Give examples of models or simulations and how they can be used to learn about what they represent.
- Identify and use a number of types of models such as geometric figures, graphs, and maps to describe observations of the environment.
- Interpret information and situations by noting associations and similarities, and recognizing patterns, trends, relationships, and sequences.

Mathematics 29-31, 48-49, 60
Benchmarks for Science Literacy 267-268
English Language Arts 37
Geography 47-48

g) ***Developing explanations*** -- Learners can describe their observations of the environment or environmental topics and develop simple explanations that address the questions that began their inquiry.

- Summarize information, compare findings, and use simple mathematics to analyze data.
- Distinguish between relevant and irrelevant information and make valid arguments in developing explanations.
- Use models and examples to explain their thinking.

Mathematics 29-30
History 22
Geography 48-49
English Language Arts 40

Theme #2
Knowledge of Environmental Processes and Systems

Theme #2A
The Earth as a Physical System

Guidelines

a) *Processes that shape the Earth.* Learners are able to identify and offer basic explanations for changes and differences in the physical environment.

Geography 118-119
Benchmarks for Science Literacy 72

- Identify some of the forces that cause erosion and other changes within their own region, pointing out factors such as freezing and thawing, wind, soil-building processes, and gravity.
- Identify some distinctive landforms both within their region and, using maps and images, in other areas of the world.
- Differentiate among climates, looking at factors such as precipitation, temperature, and resident plants and animals.

b) Changes in matter. Learners are able to identify basic characteristics of and changes in matter.

Benchmarks for Science Literacy 76-77
Science 127

- Describe objects in terms of the materials they are made of and their observable properties. For example, differentiate among buildings constructed with different materials and discuss why different materials may have been selected based on properties such as rigidity, ability to reflect or gather heat, and transparency.
- Identify changes in the properties of materials caused by heating or cooling using the change of water from solid to liquid to gas in the environment as an example.
- Provide examples of how combining two or more materials can result in a new material that has different properties than the original ones.
- Describe the basic elements of the hydrologic cycle and the "rock cycle" (including erosion, transport, and deposit). Locate examples of elements of these cycles in the local environment.

c) ***Energy.*** While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.

- Identify different forms of energy including light, heat, electricity, and magnetic energy. Identify examples of these different forms in the community and the natural environment.
- Explain some of the ways in which heat, light, or electricity are produced, travel, and are stored or used. Use examples such as the sun, power generation, batteries, and so forth.

Science 127
Benchmarks for Science Literacy 83-84

Theme #2B
The Living Environment

Guidelines

a) *Organisms, populations, and communities.* Learners understand basic similarities and differences among a wide variety of living organisms. They understand the concept of habitat.

Benchmarks for Science Literacy 102-103
Science 129

- Identify similarities and differences among living organisms ranging from single-celled organisms that they can observe under microscopes to plants and animals that they encounter through direct observation or through videos, books, or other media.
- Classify or group organisms according, for example, to how animals bear their young, anatomical features, or habitats.
- Describe the basic needs of all organisms and explain how organisms meet their needs in different types of environments such as deserts, lakes, or forests.

b) *Heredity and evolution.* Learners understand that offspring of both plants and animals closely resemble their parents and each other, but that the resemblance is not exact.

Science 129
Benchmarks for Science Literacy 107, 123

- Identify some likenesses among offspring and parents as being inherited and others as resulting from the organism's interactions with its environment.

- Describe some ways in which variation among individuals of the same species can sometimes give certain individuals an advantage within a specific environment.
- Compare fossils and living organisms to identify similarities and differences between organisms that lived long ago and those that are alive today.

c) ***Systems and connections.*** Learners understand the basic relationship of organisms to their environments and that different organisms have different relationships with other organisms and environments.

Science 129
Benchmarks for Science Literacy 116

- Describe ways in which an organism's behavior patterns are related to its environment. Identify examples of environmental change and discuss how these changes may be beneficial or detrimental to particular organisms.
- Identify ways in which organisms (including humans) cause changes in their own environments. Discuss how these changes may be beneficial or detrimental to the organisms or other organisms.
- Identify ways in which organisms interact with each other. For example, some animals eat plants, some fish depend on other fish to keep them free of parasites, earthworms keep soil loose and fertile.

d) ***Flow of matter and energy.*** Although they may not be familiar with a precise definition of "energy," learners know that living things need some source of energy to live and grow.

Benchmarks for Science Literacy 119
Science 129

- Explain the dependence of most living organisms on the sun as the source of their life energy. Give examples that illustrate the understanding that animals, even those that eat other animals, ultimately depend on plants for this energy and that plants depend on the sun.
- Describe how matter can be recycled, sometimes in a changed form from the original material. Use examples from their own experience, such as fleece jackets made from recycled soda bottles or envelopes made from recycled telephone books.
- Explain the process of life, growth, death, and decay of living organisms as a form of recycling. For example, use a compost pile as an example of recycling of living materials.

Understanding the Local Environment
In Grades K-4

The final version of these guidelines will contain a section that provides guidance of what learners should know about their local environment. Proceeding through the grade levels, learners should both broaden and deepen their understanding of the systems that comprise their local environment.

In the space below, please list the basics of what learners should know by the end of 4th grade. Consider natural history and environmental knowledge as well as an understanding of how environmental services are provided (like waste disposal, energy production, etc.) and any other factors that you believe should comprise a 4th grade graduate's knowledge of the local environment.

Theme #2C
Humans and Their Societies

Guidelines

a) *Individuals and groups.* Learners understand that people act as individuals and as group members and that groups influence individual action.

Benchmarks for Science Literacy 140, 154, 158
Social Studies 57-62

- Give examples of influences on individual behavior, particularly behavior that affects the environment. For example, consider the influence of classmates, laws, teachers, and family members on whether a person drops a candy wrapper on the playground.
- Identify some of the many groups that individuals can belong to at the same time. Describe some tensions that exist between groups and that a person might feel as a result of belonging to different groups.
- Identify ways in which groups work to meet personal needs and the common good. For example, discuss how school or after-school clubs (such as environmental clubs or scouting troops) benefit their members and how these clubs also work on projects that benefit the whole school or community.

b) *Culture.* Learners understand that experiences and places may be interpreted differently by people with different cultural backgrounds, at different times, or with other frames of reference.

Social Studies 49-50
Geography 117, 124-125
Benchmarks for Science Literacy 154

- Describe a favorite place or their own community from a variety of perspectives, including their own.
- Role-play the reactions of different people to a place or historical event.
- Compare how people live in different regions and how different cultures meet basic human needs. For example, prepare a visual display that compares how people support themselves in different regions and discuss how those livelihoods can both affect the environment and depend on the environment.

c) ***Political and economic systems.*** Learners are able to link the existence of government and economic systems with the results of people living together in groups, including the need to provide for needs and wants, maintain order, and manage conflict.

Benchmarks for Science Literacy 168-169
Social Studies 63-66
Geography 126-127
Economics 5-7, 30-33

- Identify some of the ways that governments and economic systems work to protect the environment, and distribute natural resources. Give examples of laws, incentives, and penalties that affect people's behavior toward the environment and each other.
- Describe how different people meet their basic needs and how political and economic systems help.
- Identify elements of infrastructure—the ways in which information, people, and goods are moved from place to place.

d) ***Global connections.*** Students understand how people are connected at many levels—including the global level—by actions and common responsibilities that concern the environment.

Social Studies 70-72
Benchmarks for Science Literacy 176
Economics 11, 13
Geography 126-127

- Examine the relationship between individual needs and wants and larger concerns such as energy use and environmental protection.
- Describe how trade connects people around the world and enables them to have things they might not be able or willing to produce themselves.
- Trace many of the products they use to other countries. Discuss possible environmental concerns that might arise where those products are made.
- Discuss how television, computers, and other forms of communication connect people around the world.

e) ***Change and conflict.*** Learners recognize that change is a normal part of individual and societal life. They understand that conflict is rooted in different perceptions and how actions affect different individuals and groups.

- Identify aspects of family and community life that have remained constant over generations, as well as aspects that have changed.
- Give examples of rules related to the environment or an environmental topic at home, in school, or elsewhere that have changed and others that have stayed the same.
- Discuss how rules and laws concerning the environment can affect people differently and explain why considering the possible consequences of rules or decisions before they are made is helpful for society.
- Identify some basic ways in which individuals, groups, and institutions such as schools resolve conflict concerning the environment.

Social Studies 51-53
Benchmarks for Science Literacy 162, 165, 172

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Theme #2D
Environment and Society

Guidelines

a) *Human/environment interactions.* Learners understand that people depend on, change, and are affected by the environment.

Geography 132-135

- Identify ways in which people depend on the environment (e.g. for food, water, air, recreation, minerals, and other resources).
- Identify ways in which human actions change the environment. For example, list changes that activities such as building houses or stores with parking lots, farming, or damming rivers have brought about within their community or region.
- Describe how humans account for environmental conditions and the possibility of natural hazards when locating human activities.
- Describe ways in which environmental characteristics such as climate, soil and mineral types, or the presence of water both constrain and provide opportunities for humans. For example, describe why people choose to farm in some places and not in others.

b) *Places.* Learners understand that places differ in their physical and human characteristics.

Social Studies 54-56
Geography 113-117

- Observe and describe physical and human characteristics of their community or region and compare these characteristics with those of other places in the world.
- Discuss how humans create places that reflect their ideas, needs, and wants, as well as the physical environment. Illustrate with examples of places within their experience such as playgrounds, parks, classrooms, and homes.
- Describe ways in which places change over time.

c) *Resources.* Learners understand the basic concepts of resource and resource distribution.

Geography 136-137

- Distinguish among resources that are renewable and nonrenewable, and resources (like running water or wind) that are available only in certain places at certain times.
- Describe the role that various resources play in their daily lives.
- Locate sources of various resources on a map.
- Link patterns of human settlement and other activity with the presence of specific resources.

d) *Technology.* Learners understand that technology is an integral part of human existence and culture.

Benchmarks for Science Literacy 54, 181-207

- Describe technologies as tools and ways of doing things that humans have invented. Give examples of technologies that affect their lives in areas such as transportation, communications, nutrition, and entertainment.
- Identify drawbacks and benefits of specific technologies considering the fact that technologies can benefit some humans and other organisms while harming others.
- Identify important technological systems such as agriculture, transportation, and manufacturing.

e) Environmental issues. Learners are familiar with a range of local environmental issues and understand that people in other places experience environmental issues as well.

Geography 140-141

- Identify ways in which the local environment has changed, is changing, or is predicted to change.
- Describe differences in the ways people perceive specific changes in the local environment.
- Discuss how people in other places with similar conditions might react or perceive the situation in similar ways.

Environmental Issues in Kindergarten through Fourth Grade

The final version of these guidelines will contain a series of examples of environmental issues that are appropriately examined at each grade level.

Please provide a couple of examples of issues that are appropriate at the K-4 level. Add clarifying notes, if you wish, about how K-4 learners can approach the issue.

Theme #3
Skills for Understanding and Addressing Environmental Issues

Theme #3A
Skills for Analyzing Environmental Issues

Guidelines

Social Studies 54-56

a) *Analyzing issues* – Learners are able to analyze, in basic ways, environmental issues and proposed solutions.

- Identify environmental problems and issues.
- Apply ideas of past, present, and future to specific environmental issues. Describe what has changed, is changing, and is expected to change regarding a particular issue. Discuss how long the issue has existed.
- Identify people and groups of people that are involved in the issue.
- Identify some of the decisions and actions related to the issue.
- Identify proposed solutions to the issue and discuss arguments for and against them.

b) Sorting out the implications of issues – As students come to understand that environmental and social phenomena are linked, they are able to explore the implications of issues.

- Observe and speculate about social, economic, and environmental effects of changes, conditions, and proposed solutions to issues.
- Describe short-term and long-term impacts of existing uses of land and other resources in the home, community, region, and beyond.
- Discuss how the issue affects different individuals and groups.

c) ***Forming and evaluating personal positions*** --
Learners are able to examine and express their own views on environmental issues.

- Identify and express their own views on environmental issues and alternative ways to address them.
- Test their views against what they know and believe, remaining open to new information and ideas.
- Identify unanswered questions.
- Identify, clarify, and express their own beliefs and values regarding the environment.

Geography 140-141
History 23
Social Studies 57-59

Theme #3B
Skills for Investigating Environmental Issues

Guidelines

a) *Investigating issues* -- Learners are able to identify and investigate issues in their local environments and communities.

Social Studies 49-53, 57-62
History 6, 23
Arts 32

- Identify and describe a current or historical environmental issue.
- Use primary and secondary sources of information to explore the issue or dilemma confronting people in a current or historical situation.
- Identify key individuals and groups involved. Describe their points of view and discuss what seems to motivate different individuals and groups to take their positions on the issue.
- Identify proposed strategies for resolving the issue.

b) *Identifying and evaluating alternative solutions and courses of action* -- Students understand that there are many approaches to resolving issues.

Social Studies 73-75
Geography 44
English Language Arts 41
History 23

- Explain why various strategies may be effective in different situations, and that they are likely to have distinct effects on society and the environment. Illustrate with examples from a specific issue.
- Describe some of the different levels at which action can be taken--for example by individuals, families, school classes, different levels of government, or businesses. Identify ways that these groups might take action on a specific issue.
- Propose alternative approaches to problems.

c) *Working with flexibility, creativity, and openness* -- Learners understand the importance of sharing ideas and hearing other points of view.

English Language Arts 31-33, 40-42, 44-45
Mathematics 29
Social Studies 57-59
Geography 140

- Engage in critique and discussion as part of the process of inquiry. Explain these processes.
- Hear and respect different perspectives and communicate with people whose lives, cultures, and viewpoints are different from their own.
- Identify ideas and interpretations that differ from theirs. Discuss the strong points and drawbacks of different perspectives.

Theme #3C
Decision-making and Citizenship Skills

Guidelines

a) *Evaluating the need for citizen action* -- Learners are able to consider whether they believe action is needed in particular situations and whether they think they should be involved.

- Discuss whether citizens should take action on a particular environmental issue considering findings from their issue investigations such as the causes of the problem and the most promising strategies for addressing it.
- Identify types of citizen action and discuss their likely effects in the context of a specific issue.
- Discuss whether and how they think they would like to be involved. Identify reasons for and against taking specific kinds of action.

b) *Planning and taking action* -- By participating in issues of their choosing--mostly close to home--students learn the basics of individual and collective action.

Social Studies 30, 73-75
Civics and Government 6

- Develop plans for individual and collective action based on knowledge of a range of citizen action strategies and the results of investigations of a particular environmental issue. Include clear reasons and goals for action.
- Develop action plans based on an understanding of the complexity of the issue. Set realistic goals and include measures of success consistent with learners' abilities.
- Decide whether their plan should be implemented immediately or at another time, modified, or abandoned; and carry through with action when appropriate.

c) ***Evaluating the results of actions*** -- Learners understand that civic actions have consequences.

History 23-24
Social Studies 73-75

- Describe the apparent effects of their own actions and actions taken by other individuals and groups.
- Discuss some of the reasons why identifying the effects of actions may be difficult, considering, for example, the time required to see effects, the influences of others' actions, and other changes in the situation.

Theme #4
Personal and civic responsibility

Guidelines

a) *Understanding societal values and principles* -- Learners can identify the fundamental principles of U.S. society and explain their importance in the context of environmental issues.

Civics and Government 22-27
Social Studies 60-64, 73-75

- Describe some beliefs that many U.S. citizens hold in common and explain the importance of these shared values in motivating people to act on environmental issues.
- Discuss how their own beliefs about the environment and issues compare to these general, societal beliefs.
- Recognize tensions that occur when basic values and beliefs differ. Illustrate with examples from environmental issues with which they are familiar.

b) *Recognizing citizens' rights and responsibilities* -- Learners understand the basic rights and responsibilities of citizenship.

Social Studies 73-75
Civics and Government 35-37

- Identify examples of the personal, political, and economic rights of U.S. citizens.
- Identify examples of the responsibilities of citizenship.
- Discuss rights and responsibilities in the context of local environmental issues.

c) *Recognizing efficacy* -- Learners possess a realistic self-confidence in their effectiveness as citizens.

Social Studies 38-39,60-62
Civics and Government 38-39

- Describe ways in which individuals and groups act within society to create change, to meet individual needs, and to promote the common good.
- Recognize themselves as being able to make a difference through their own actions. This sense of efficacy is linked to situations over which students have some control (for example, in the classroom, at home, or in the community) and that are appropriate to their level of understanding.
- Identify ways in which citizen action influences how public policies address issues of public concern.

Social Studies 73-75
Civics and Government
38-39

d) *Accepting personal responsibility* – Learners understand that they have responsibility for the effects of their actions.

- Identify and describe some of the effects that they and the groups they belong to (e.g., family or school class) have on the environment and on humans and other living things.
- Discuss the notion of responsibility and identify some of their personal responsibilities.

Guidelines for Fifth through Eighth Grades

Theme #1
Questioning and Analysis Skills

Guidelines

a) Questioning -- Learners modify, clarify, and focus questions to guide their learning and environmental investigations.

Science 145
Mathematics 75-77
Geography 49

- Identify environmental questions, problems, and issues based on newspaper and magazine articles, videos, and personal experiences both in and outside school.
- Create visual presentations (such as maps or graphs) and written and oral statements that reflect a clear understanding of an environmental problem or situation.
- Pose clear questions and ideas to test (hypotheses).
- Clarify their own guiding beliefs about the environment and discuss how those beliefs are reflected in the questions they ask.

b) Designing investigations -- Learners design environmental investigations to answer particular questions—often their own questions.

Science 145, 148
Mathematics 75-77

- Connect questions with appropriate types of inquiry.
- Define the scope of their inquiry, identifying the main variables and phenomena to be studied.
- Select appropriate systems of measurement and observation.
- Select tools that are appropriate for their environmental investigations based on the question asked and the type of information sought.

c) Evaluating credibility -- Students are able to judge the merits or strength of the information they are using.

History 67-68
Science 143, 148
Mathematics 75-80

- Question vague claims they hear on television or through other media. For example, examine the credibility of public survey information looking at factors such as sampling methods, logical conclusions, and appropriate analogies.
- Identify factors that affect the credibility of information including assumptions and procedures used to create it; the social, political, and economic context in which the information was created; and bias due to omission, suppression, or invention of factual information.
- Examine evidence, identify faulty reasoning, and apply other basic logic and reasoning skills in evaluating information sources.
- Identify gaps in information that indicate a need for further discovery.

d) Collecting information -- Learners are able to locate and collect information about the environment or environmental topics from a variety of sources in a variety of ways.

Geography 49-50, 144-145
Science 145
Mathematics 116-119
History 67-68
Social Studies 35
English Language Arts 27-29, 38-41

- Observe systematically, measure accurately, and keep thorough and accurate records, which may include written notes and data tables, sketches, and photographs.
- Understand and can use various systems of measurement and derived measurements such as rates.
- Use resources such as aerial photographs, satellite images, and geographical information systems; library and museum collections, historical documents, and eyewitness accounts; computerized databases and spreadsheets; and government records.
- Collect firsthand information about their own community using field study skills.
- Use electronic resources proficiently, choosing, assessing, and synthesizing materials from the wealth and complexity of resources available.

e) *Organizing information* – Learners are able to classify and order data, and to organize and display information in ways that help analysis and interpretation.

- Present environmental data in a variety of formats including charts, tables, plots, graphs, maps, and flow charts.
- Explain the way in which information is ordered and displayed in terms of the question being answered, the purpose of the display, and the strengths of the particular means of presentation.
- Present environmental data in ways that demonstrate relationships between sets of information such as population census counts of a certain bird species and the prevalence of certain tree species or habitat types.

Mathematics 98-101, 105-111
Geography 50-51, 144-145
English Language Arts 35-36
Science 145

f) *Working with models and simulations* -- Learners understand many of the uses and limitations of models.

- Describe how models are used to think about processes that are difficult to observe directly. For example, explain how models aid in understanding long-term processes such as population growth or processes that are difficult to see such as the movement of the planets in relationship to the sun.
- Use models to represent and investigate the physical world, and manipulate mathematical and physical models using a computer.
- Evaluate models based on the question being investigated, accounting for variables such as the complexity of the model, its scale, and its ability to represent important features of the process being modeled.

Mathematics 98-101, 112-115
Geography 144-145
Science 145

g) *Developing explanations* – Learners are able to synthesize their observations and findings into coherent explanations.

- Distinguish between description and explanation and give examples of each based on their own environmental investigations.
- Base their explanations on what they observed or learned through research, selecting which evidence to use and accounting for discrepancies. Synthesize and interpret information from a range of sources.
- Consider the relationships among two or more variables.

Mathematics 81-83
History 68
Geography 51-52
English Language Arts 40
Science 145-148

Theme #2
Knowledge of Environmental Processes and Systems

Theme #2A
The Earth as a Physical System

Guidelines

a) *Processes that shape the Earth.* Learners understand the basics of most of the physical processes that shape the Earth. They are able to explore the origin of differences in physical patterns.

Geography 156-157
Benchmarks for Science Literacy 73
Science 160

- Analyze physical patterns such as climate, areas of geothermal activity, soil types, and arid regions, suggesting reasons for these patterns. Explain in terms of abrupt forces (such as earthquakes or major storms) and long-term processes (such as erosion and rock formation), as well as those that are human-caused (such as suburban development or agricultural practices).
- Predict the consequences of specific physical phenomena such as a hurricane in a coastal area or heavy grazing in an arid region;
- Relate physical processes and patterns (such as climate, weather phenomena, and seasonal change) to the Earth/Sun relationship.

b) *Changes in matter.* Learners understand the properties of the substances that make up objects or materials found in the environment.

Benchmarks for Science Literacy 77-79
Science 154

- Describe a variety of chemical reactions and offer examples from daily life and the local environment.
- Explain the different phases of matter (solid, liquid, and gas) in terms of atomic and molecular motion.
- Explain an object's characteristics based on its composition and how it was formed. For example, describe the characteristics of different types of rock and account for these characteristics based on their constituent parts and the processes by which they were formed.

c) ***Energy.*** Students begin to grasp formal concepts related to energy by focusing on energy transfer and transformations. They are able to make connections among phenomena they studied separately in the earlier grades such as light, heat, magnetism, electricity, and the motion of objects.

Science 155
Benchmarks for Science Literacy 84-85

- Trace where energy comes from and goes in examples that encompass several different transfers and transformations of energy. One such example is to trace the path of energy in the creation and use of fossil fuels.
- Explain how solar energy powers the movement of global air masses, the hydrological cycle and ocean currents.
- Understand that the process of life is based on the conversion, utilization, storage and transfer of energy. Plants convert solar energy to chemical energy used in growth and propagation. Animals that eat plants use part of this stored energy for their own growth and maintenance, while some is dissipated as heat.

Theme #2B
The Living Environment

Guidelines

a) *Organisms, populations, and communities.* Learners understand that biotic communities are made up of plants and animals and that they are uniquely adapted to live in particular environments.

Benchmarks for Science Literacy 104
Science 156-157
Geography 158-159

- Link features of internal and external anatomy with the ability of organisms to make or find food and reproduce in particular environments.
- Define and give example to illustrate the concepts of species, populations, communities, and ecosystems. Trace and give examples of connections among organisms at those levels of organization.
- Understand that some animals and plants have adapted to extreme environmental conditions. Give examples of adaptations that are behavioral (for example, the migration of Canada geese and other birds) and physical (such as the ability of desert animals and plants to exist on minimal amounts of water).
- Describe how organisms differ in how they use energy giving examples of organisms that use energy quickly for growth and metabolism, and therefore must replace it quickly (e.g., a hummingbird) and others that use energy more slowly and therefore need to replace it less frequently (e.g., a python). Predict the habitat needs of these different types of organisms.

b) *Heredity and evolution.* Learners understand that all living things reproduce and that many of the characteristics of living things are inherited.

Science 157-158
Benchmarks for Science Literacy 108, 124

- Identify some basic traits of organisms. Explain how specific traits increase the likelihood that individual organisms will survive and reproduce in particular environments.

- Describe in general terms the process of natural selection for particular traits and how it can result in descendants that are quite different from their ancestors.
- Define extinction and discuss the possible implications of permanent loss of a species and its social, behavioral, and genetic heritage.

c) ***Systems and connections.*** Learners understand major kinds of interactions among organisms or populations of organisms.

Science 157-158
Benchmarks for Science Literacy 117
Geography 158

- Describe and give examples of producer/consumer, predator/prey, and parasite/host relationships.
- Identify organisms that are scavengers or decomposers. Describe the roles they play within particular systems focusing on their relationship to other organisms and physical elements of the system.
- Describe relationships among organisms that are characterized by competition for limited resources or of mutual benefit to the organisms.
- Describe ways in which particular environments limit the growth and survival of organisms and populations.
- Summarize how abiotic components (soil, water, atmosphere, energy) in combination usually determine the structure of an ecosystem. For example, the amount of rainfall, along with average temperature, may determine whether a region is characterized by forest, grassland or desert ecosystems.

d) ***Flow of matter and energy.*** Learners understand how energy and matter flows among the abiotic and biotic components of the environment.

Benchmarks for Science Literacy 120
Science 158

- Trace the flow of energy through food webs that identify relationships among organisms in natural systems.
- Explain how matter is transferred among organisms and between organisms and their environment in these food webs.
- Describe how energy, which enters ecosystems as sunlight, changes form and is transferred in the exchanges (production, consumption, and decomposition) that comprise food webs.

Understanding the Local Environment
In Grades 5-8

The final version of these guidelines will contain a section that provides guidance about what learners should know about their local environment. Proceeding through the grade levels, learners should both broaden and deepen their understanding of the systems that comprise their local environment.

In the space below, please list the basics of what learners should know by the end of 8th grade. Consider natural history and environmental knowledge as well as an understanding of how environmental services are provided (like waste disposal, energy production, etc.) and any other factors that you believe should comprise an 8th grade graduate's knowledge of the local environment.

Theme #2C
Humans and Their Societies

Guidelines

a) *Individuals and groups.* Learners understand that how individuals perceive the environment is influenced by both individual traits and group membership or affiliation.

Benchmarks for Science Literacy 141-142, 155, 159
Social Studies 88

- Describe individual development and identity in terms of learning, perception, innate abilities, motivation, social influences, and experience. Interpret their own environmental perceptions using similar concepts.
- Explain how group membership--and shared values, beliefs, and assumptions--can influence individuals, impel different reactions to physical and social environments and changes, and cause social change. For example, describe how family, religion, gender, ethnicity, socioeconomic status, and other factors may influence individuals' values and perceptions about the environment and their communities.
- Identify and critique instances of stereotyping based on group affiliation (for example, demonstrating how people identified as "environmentalists" or "industry types" may have very different perspectives from one another).

b) *Culture.* As they become familiar with a wider range of cultures and subcultures, students gain an understanding of cultural perspectives on the environment and how the environment may, in turn, influence culture.

Social Studies 79-81
Geography 154-155, 162-163
Benchmarks for Science Literacy 155

- Explain how the environment is perceived differently by various cultures, and how these perspectives may lead people to different perceptions of the environment. For example, based on stories from other cultures, determine what is considered beautiful, valuable, or frightening in the environment.
- Explain how new technologies can change cultural perceptions and social behavior. For example, discuss how snowmobiles have changed native Alaskan lives or the impact of air conditioning on settlement in southern Florida.
- Identify ways in which transportation and communications technology helps spread cultural values and behavior patterns.

c) ***Political and economic systems.*** Learners become more familiar with political and economic systems and how these systems take environmental systems into consideration.

- Identify and describe the basic features of the U.S. political and economic systems focusing on how they account for and distribute natural resources.
- Differentiate among public and private goods and services, using environment-related goods and services to illustrate. For example, examine the values and functions of wetlands, distinguishing among public goods such as groundwater recharge, flood control, and wildlife habitat, and private goods such as their value for agricultural production or water storage, or the value of draining the land for other uses. Discuss difficulties encountered in drawing these distinctions.
- Identify economic and political features of the local community and state, and describe how environmental decisions can be influenced by these economic and political systems.

Benchmarks for Science Literacy 169
Social Studies 94-98
Geography 164-166
Civics 47-52, 61-70
Economics 5-7, 19-20, 30-33

d) ***Global connections.*** As students become familiar with human social, economic, cultural, and political structures, they understand that these structures influence and are influenced by systems beyond the United States.

- Explain the motivations for international trade in terms of uneven distribution of resources and differing costs of producing similar goods (due to factors such as climate, labor costs, and energy costs).
- Describe ways in which the global environment is affected by individual and group actions, as well as by government policies and actions having to do with energy use and other forms of consumption, waste disposal, resource management, industry, and population.
- Develop a map or another visual presentation that shows how environmental change in one part of the world can have consequences for other places.
- Identify a variety of global links, including transportation and communication systems, treaties, and international organizations.

Benchmarks for Science Literacy 177
Social Studies 102-104
Geography 164-166, 171-172
Civics 71-73

e) Change and conflict. Learners understand that human systems change over time and that conflicts sometimes arise over differing viewpoints and goals about the environment.

Social Studies 82-84, 91-93
Benchmarks for Science Literacy 163, 166, 173

- Describe patterns of change within and across cultures, communities, and other groups. Consider the rapidity of change, mechanisms that helped spread change, and what motivated change.
- Explain how change affects individuals and groups differently and give examples of the trade-offs involved in decisions and actions ranging from the individual to the societal levels. For example, discuss how a decision about where to site a landfill, build a chemical plant, or locate a new highway might affect different neighborhoods, businesses, workers, and others.
- Describe and analyze examples of tensions between individual rights and benefits and the societal good.
- Identify some of the formal and informal ways that groups (including governments) attempt to resolve conflicts related to the environment.

Theme #2D
Environment and Society

Guidelines

a) *Human/environment interactions.* Learners understand that human-caused changes have consequences for the immediate environment as well as for other places and future times.

Geography 172-175
Science 168-169

- Describe both intended and unintended environmental and social consequences associated with the changing use of technologies (such as nuclear power plants or pesticides).
- Explain how human-caused environmental changes cause changes in other places. For example, discuss the consequences of building a dam on the downstream plant and animal communities as well as on human communities.
- Speculate about the likely environmental consequences of environmental restoration efforts (such as wetlands creation).

b) *Places.* Learners begin to explore the meaning of places both close to home as well as within their region and around the world.

Geography 150-155
Social Studies 85-87, 99, 101

- Analyze physical and human characteristics of places and make inferences about how and why these characteristics have developed and changed over time. For example, use maps and satellite photographs to examine how cities change in response to natural disasters such as floods, hurricanes, or earthquakes.
- Identify regions based on different criteria and describe the relationships among the physical and human characteristics of regions.
- Identify ways in which personal perceptions, culture, and technology influence people's perceptions of places and discuss the importance of some places (such as Yellowstone or Yosemite National Park) as cultural symbols.

c) *Resources.* Learners understand that uneven distribution of resources around the world influences their use and perceived value.

Economics 1-3
Geography 176-178

- Map and discuss distribution and use patterns for specific resources, such as metals, fresh water, or certain types of forests. Recognize that the people of the world's nations consume different proportions of the earth's resources. This is a factor of both population size and varied geographic or economic distribution of resources.
- Explain why certain resources (such as energy) are key to the development of human societies, and identify resources that were critical to development at different times.
- Explain conflicts between individuals or nations noting factors such as differing attitudes about the use of specific resources and scarcity of natural resources.
- Account for the availability of resources in terms of current levels of technology and human priorities (i.e., economic and environmental concerns).

d) *Technology.* Learners understand the human ability to shape and control the environment as a function of the capacities for creating knowledge and developing new technologies.

Benchmarks for Science Literacy 55-56, 181-207

- Discuss technologies in the context of larger systems that have shaped the course of human history as well as human relationships with the environment. Use illustrations from the great revolutions (agricultural, industrial, transportation, and so on) that have dramatically changed how people live.
- Give examples of how the ability to develop and use technology gives humans great influence over the environment and other living things.
- Identify some of the important environmental and social issues related to particular technological systems in fields such as agriculture, manufacturing, and energy.

e) ***Environmental issues.*** Learners are familiar with a range of environmental issues at scales that range from local to national to global. They understand that people in other places around the world share many of the issues they are concerned about locally.

Geography 181-182

- Identify other places, either contemporary or historical, experiencing similar issues as are being experienced in the learner's community or region.
- Explain how issues arise because of conflicting points of view about a specific proposal, event, or condition in the environment. For example, discuss the conflicting perspectives that create issues around proposals to build large-scale dams such as the Three Gorges project in China or damming Hetch-Hetchy in the U.S.

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Environmental Issues in Fifth through Eighth Grades

The final version of these guidelines will contain a series of examples of environmental issues that are appropriately examined at each grade level.

Please provide a couple of examples of issues that are appropriate at the 5-8 level. Add clarifying notes, if you wish, about how 5-8 learners can approach the issue.

Theme #3
Skills for Understanding and Addressing Environmental Issues

Theme #3A
Skills for Analyzing Environmental Issues

Guidelines

a) *Analyzing issues* -- Learners are able to analyze environmental issues and proposed solutions.

History 68-70
Geography 164-166, 169-170, 179-182

- Identify environmental conditions and changes and clearly articulate the issues that arise around them.
- Identify key individuals and groups involved, describe their positions, and identify key areas of conflict.
- Examine how others have analyzed and understood the issue, identifying their approaches and the assumptions behind them.
- Compare the issue with similar issues from other places and times.

b) *Sorting out the implications of issues* -- Learners are able to apply their knowledge of ecological and human processes and systems to identify the implications of specific environmental issues for those systems.

Social Studies 85-87
Geography 171-172

- Describe the effects of human actions on specific elements and processes of the environment.
- Analyze issues by looking at what tradeoffs have been made such as where various human activities are located and their effects on different places and different segments of the population.
- Speculate about the effects of proposed environmental regulations on different sectors of the economy, and on neighborhoods, public health, particular plant and animal species and communities, and overall environmental quality.
- Project the consequences of inaction or failure to resolve particular issues.

c) ***Forming and evaluating personal positions*** – Students are able to identify, justify, and clarify their views on environmental issues and alternative ways to address them.

- Compare their views with those held by others.
- Justify their positions based on information from a variety of sources, personal beliefs and values, and clear reasoning.
- Discuss their own beliefs and values regarding the environment and relate personal positions to these views.
- Identify ways in which others' views correspond or differ with their own views.
- Discuss personal positions with classmates with openness to new ideas and information.

Social Studies 88-90
Geography 179-182
History 70

Theme #3B
Skills for Investigating Environmental Issues

Guidelines

a) *Investigating issues* -- Using primary and secondary sources of information, learners apply their growing research and analytical skills to investigating environmental issues, beginning with those in their own community.

History 6, 68-70
Social Studies 79-93, 105-107

- Clearly articulate and define environmental issues. Describe the history and origins of the issue, actions that have been taken to address the issue, the apparent effects of these actions, and the current situation.
- Identify key individuals and groups involved, their viewpoints, and the solutions or courses of action they support.
- Investigate the issue using secondary sources and original research where needed.
- Research relevant historical antecedents and contemporary parallels to shed light on current issues.

b) *Identifying and evaluating alternative solutions and courses of action* -- Learners are able to examine and propose action strategies for addressing particular issues.

Social Studies 105-107
English Language Arts 41
History 70

- Recognize and explain multiple points of view about an issue and identify the action approaches that are rooted in those views.
- Consider the issue from many points of view, using different perspectives, types of data, and means of analysis to propose alternative approaches to problems and issues.
- Describe the strengths and weaknesses of various approaches to analyzing issues (such as cost- benefit analysis, ethical analysis, environmental impact analysis, risk analysis). Discuss the ideas behind each approach including which factors are important to look at and which values are important to protect.
- Independently and in groups, develop original strategies to address issues.
- Discern similarities and differences in problem situations which might affect their ability to apply strategies that were successful in other places and times.

c) Working with flexibility, creativity, and openness -- Students are able to consider the assumptions and interpretations that influence the conclusions that they and others draw about environmental issues.

- Explain how the interplay of ideas and perspectives strengthens the process of inquiry and the societal ability to address issues.
- Are open to questions and alternative explanations that others offer in discussions as well as in readings.
- Explain why it is not always possible to select one correct explanation or a single best approach to addressing an issue.

English Language Arts 31-33, 40-42, 44-45
Social Studies 88-90
Geography 181
Science 148
Benchmarks for Science Literacy 286-287

Theme #3C
Decision-making and Citizenship Skills

Guidelines

Social Studies 105-107
Civics and Government 6

a) *Evaluating the need for citizen action* -- Learners are able to reason through whether they believe action is needed in particular situations, and decide whether they should be involved.

- Discuss whether action is warranted, accounting for factors such as the scale of the problem; legal, social, economic, and ecological consequences; and alternatives to citizen action.
- Identify different forms of actions that citizens can take in the economic, political, and legal spheres, as well as actions aimed at directly improving or maintaining some part of the environment, or persuading others to take action.
- Speculate about the likely effects of specific actions on society and the environment and the likely effectiveness of these actions in resolving a specific environmental issue.
- Point out advantages and disadvantages of their personal involvement, considering factors such as their own skills, resources, and commitment.

b) *Planning and taking action* – As students begin to see themselves as citizens taking active roles in their communities, they are able to plan for and engage in citizen action at levels appropriate to their maturity level and preparation.

- Develop plans for individual and collective action based on knowledge of a range of citizen action strategies and the results of investigations of a particular environmental issue. Include clear reasons and goals for action.
- Develop action plans based on an understanding of the complexity of the issue. Set realistic goals and include measures of success consistent with learners' abilities.
- Decide whether their plan should be implemented immediately or at another time, modified, or abandoned; and carry through with action when appropriate.

c) ***Evaluating the results of actions*** -- Learners understand that civic actions have consequences. They are able to evaluate the effects of their own actions and actions taken by other individuals and groups.

- Analyze the influence and effectiveness of decisions, policies, and actions taken by individuals and groups within the context of a particular issue.
- Analyze their own actions, explaining apparent effects and discussing them in light of students' goals and reasons for acting.
- Describe some of the reasons why evaluating the results of actions may be difficult, including the scale of the issue, the time required to see effects, and the influence of other actions and factors.

Theme #4
Personal and civic responsibility

Guidelines

a) *Understanding societal values and principles* -- Learners understand that societal values can be both a unifying and a divisive force.

Civics 58-60
Social Studies 91-95, 105-107

- Identify some of the shared political values and principles that unite American society and explain their importance.
- Discuss conflicting views about the meaning and application of shared values in specific issues. For example, explore conflicting views about the idea that one person's rights end where they infringe on another's. Use a specific context such as a question about whether to permit an industrial facility or housing development that is likely to pollute a stream.
- From speeches and writings on specific environmental issues, identify ways in which advocates appeal to values such as individual freedoms, property rights, the public good, and patriotism.

b) *Recognizing citizens' rights and responsibilities* -- Learners understand the rights and responsibilities of citizenship and their importance in promoting the resolution of environmental issues.

Social Studies 20, 105-107
Civics 74-78

- Identify rights and responsibilities associated with citizenship, including personal and civic responsibilities.
- Describe ways in which commonly accepted rights and responsibilities of citizenship motivate people to help resolve environmental issues. Consider rights and responsibilities such as acquiring, using and selling property; the right to vote; freedom of speech and assembly; accepting responsibility for the consequences of one's actions; obeying the law; and respecting the rights and interests of others.

c) ***Recognizing efficacy*** -- Learners possess a realistic self-confidence in their effectiveness as citizens.

Social Studies 91-93, 105-107
Civics 80-83

- Explain the ways in which citizen action and public opinion influence environmental policy decisions.
- Describe ways in which individuals and groups act within society to create change, meet individual needs and promote the common good.
- See themselves as effective actors. This sense of efficacy extends beyond the classroom and the home, and begins to encompass the broader communities in which students begin to see possibilities for action.

Civics 79-80

d) ***Accepting personal responsibility*** -- Learners understand that their actions can have broad consequences and that they are responsible for those consequences.

- Analyze some of the effects that their actions (and the actions of their families, social groups, and communities) have on the environment, other humans, and other living things.
- Describe actions in terms of their impacts that reach into the future.
- Describe their personal responsibilities, comparing their view of their responsibilities with commonly accepted societal views.
- Demonstrate appropriate responsibility for their role in helping to resolve environmental issues within that community.

Guidelines for Ninth through Twelfth Grades

Theme #1
Questioning and Analysis Skills

Guidelines

a) Questioning — Learners modify, clarify, and focus questions to guide learning and environmental investigations of various types. They understand some of the influences on their questioning.

Science 148, 175
History 68
Mathematics 75-77
Geography 53

- Identify and articulate an environmental phenomenon or topic to be studied.
- Pose a research question or hypothesis, identifying and defining key variables, based on primary and secondary sources of information. For example, develop hypotheses about land use in a region drawing on maps, newspaper articles, databases, and personal observations.
- Identify historical and current ideas and beliefs— for example about the environment, human perceptions of the environment, or the nature of knowledge—that shape their questions.

b) Designing investigations — Learners know how to design investigations to answer particular questions—often based on their own experience. They are able to develop approaches for investigating unfamiliar types of problems and phenomena.

Science 175
Mathematics 137-138, 167-170
Geography 53

- Connect questions with appropriate means of inquiry, including scientific investigations, historical inquiry, and social science observation and research.
- Select and develop appropriate formulas and procedures for conducting environmental investigations.
- Incorporate a variety of technologies into environmental investigations, ranging from measurement instruments to computers.

c) *Evaluating credibility* — Learners can apply basic logic and reasoning skills to detect and evaluate information gaps, bias, internal consistency, and credibility in a variety of information sources.

- Identify logical errors and spurious statements in everyday situations such as political speeches about environmental issues and policies or commercial advertising.
- Look for and explain flaws such as faulty or misleading use of statistics, misrepresentation of data that is presented graphically, or biased selection of data to support a claim. For example, analyze the public debate over a local or national environmental issue, examining public speeches, advertisements, newspaper articles, and pamphlets put out by groups on various sides of the issue.

History 67-68
Mathematics 143-145
Benchmarks for Science Literacy 230, 234, 300
English Language Arts 38-39
Science 145-148

d) Collecting information — Learners are able to locate and collect information for environmental investigations of many types. They know how to use increasingly sophisticated technology to collect information, including computer programs designed to access, gather, store, and display data.

- Use basic sampling techniques such as spatial sampling and random sampling.
- Apply observation and measurement skills in field situations such as interviewing community members about environmental issues or attitudes or sampling water in a local stream.
- Gather information from a variety of sources including historical sites, censuses, tax records, statistical compilations, economic indicators, interviews or surveys, aerial photographs, and other data banks.
- Adjust information collection strategies to compensate for bias in information sources.
- Perform basic statistical analyses to describe data using quantitative measures such as means, medians, modes, variability, and probability.

Geography 53. 184-185
History 67-68
Social Studies 35
English Language Arts 27-29, 38-41
Mathematics 167-170
Benchmarks for Science Literacy 230

e) *Organizing information* — Learners are able to select and design appropriate ways of organizing information for different purposes.

- Attend to details such as the type of data, scale, accuracy of representation, and ease of interpretation.
- Work with technology designed to relate and display data, such as database and mapping software.
- Integrate and summarize information using a variety of media ranging from written texts to graphic representations, and from audiovisual materials to maps and computer-generated images.

Mathematics 154-156, 167-170
Geography 53-54, 184-185
English Language Arts 35-36

f) *Working with models and simulations* — Learners are able to create and use models to understand environmental phenomena.

- Use functions and geometric models to represent processes or objects such as movement along earthquake fault lines, traffic flows, or population growth.
- Use computers to create models and simulations. For example, project the effects of habitat fragmentation on species diversity, the air-quality effects of a new factory, the economic impacts of proposed air quality rules, or the visual changes a new housing development will make on the landscape.
- Test the usefulness of models for particular situations, and explain how a single model may apply to more than one situation and a single situation be represented by many models.

Mathematics 154-156, 157-160
Geography 54-55, 184-185
Benchmarks for Science Literacy 230, 270
Science 175
English Language Arts 37

g) ***Developing explanations*** — Learners are able to use evidence and logic in developing explanations or interpretations that address their initial questions and hypotheses.

- Speak in general terms about their confidence in specific explanations as well as possible sources of uncertainty and error. Distinguish between error and unanticipated results in formulating explanations and consider the assumptions of models and measuring techniques or devices as possible sources of error.
- Differentiate between causes and effects and identify when causality is uncertain.
- Based on experience, develop new questions to ground further inquiry, for example drawing on the results of a stream monitoring project to develop questions that guide an investigation into water quality issues in the community or the watershed.

Mathematics 143-145
History 68
Geography 55-56
English Language Arts 38-40
Science 145-148, 173-176
Benchmarks for Science Literacy 230, 299

Theme #2
Knowledge of Environmental Processes and Systems

Theme #2A
The Earth as a Physical System

Guidelines

a) *Processes that shape the Earth.* Learners understand the major physical processes that shape the Earth. They can relate these processes, especially those that are large-scale and long-term, to features of the Earth's surface.

Geography 197-198
Benchmarks for Science Literacy 74
Science 187-189

- Relate different types of climate and their distribution to processes such as the transfer of heat energy, wind and ocean currents, and the cycling of water.
- Use examples such as the El Niño effect or the Santa Ana winds to illustrate how changes in wind patterns or ocean temperatures can affect weather in different parts of the world.
- Explain distinctive landforms in terms of the physical processes (particularly those related to changes in the Earth's crust or long-term processes such as erosion) that shaped them.
- Describe or model the fundamental features of the theory of plate tectonics and use the theory to explain phenomena such as earthquakes and volcanoes.

b) ***Changes in matter.*** Learners apply their understanding of chemical reactions to round out their explanations of environmental characteristics and everyday phenomena.

Benchmarks for Science Literacy 79-80
Science 177-179

- Explain everyday chemical reactions such as burning fossil fuels, photosynthesis, or the creation of smog in terms such as the release or consumption of energy, the products of these reactions, and how these products may be involved in further chemical reactions.
- Explain the chemical components of biological processes such as photosynthesis, respiration, nitrogen fixation, or decomposition and how biological and physical processes fit in the overall process of biogeochemical cycling.
- Explain why elements cycle through the biosphere at different rates, describing influences on reaction rates. (Oxygen and nitrogen cycle quickly, for example, while phosphorus tends to be released from its immobile form more slowly, depending upon factors such as soil acidity.)

c) ***Energy.*** Learners apply their knowledge of energy and matter to understand phenomena in the world around them.

Science 180-181
Benchmarks for Science Literacy 85-86

- Compare different means of generating electricity (such as coal-burning plants, nuclear fusion reactors and hydropower) in terms of the transformation of energy among forms, the relationship of matter and energy, and efficiency/production of heat energy.
- Explain differences in conductivity among materials and relate these ideas to real-world phenomena, discussing, for example, the efficiency of various types of motors or heating systems.
- Use the laws of thermodynamics to explain why systems need a certain amount of energy input to maintain their organization.

Theme #2B
The Living Environment

Guidelines

a) ***Organisms, populations, and communities.*** Learners understand basic population dynamics and the importance of diversity in living systems.

Benchmarks for Science Literacy 105
Science 185

- Discuss the relationship of habitat changes to plant and animal populations, considering factors such as variations in habitat size, fragmentation, and fluctuation in conditions such as pH, available light, or water level. For example, students describe the effects of a lake's eutrophication on plant, insect, and fish populations or explain some of the factors that affect the size and spatial distribution of populations, including human populations.
- Explain how diversity of characteristics among organisms of a species increases the likelihood of the species surviving through changing environmental conditions.
- Explain how variation among species in a system increases the likelihood that at least some species will survive changes in environmental conditions.
- Explain how diversity of ecosystems over a landscape relates to diversity of species within that landscape.

b) ***Heredity and evolution.*** Learners understand the basic ideas and genetic mechanisms behind biological evolution.

Science 185
Benchmarks for Science Literacy 108-109, 125

- Describe the mechanisms of natural selection, incorporating factors such as genetic variation, the effect of heritable characteristics on individual survival and reproduction within a given environment, and the effects of environmental change.
- Use the theory of natural selection to account for the adaptation of organisms to specific environments.

- Using the fact that the species and individuals that are alive today provide the basis for ongoing evolution, explain the idea that the more diversity there is today, the more there may be in the future. Offer examples of exceptions to this general rule, and use it to help explain past mass extinctions.

c) *Systems and connections.* Learners understand the living environment to be comprised of interrelated, dynamic systems.

Benchmarks for Science Literacy 117
Science 186
Geography 158-159

- Apply the concepts of ecosystem and ecoregion to account for the multitude of relationships among organisms and environments encountered in earlier studies.
- Discuss the relative stability of ecosystems over long spans of time, using ideas such as interdependence, cyclic fluctuations, equilibrium, and coupled oscillations (e.g. in predator-prey relationships).
- Discuss the interactions among organisms and their environments, explaining ecosystem change with respect to variables such as climate change, the introduction of new species, and human impacts, and explaining processes such as desertification and soil formation.
- Describe succession in ecosystems and their constituent plant and animal communities. Illustrate this idea with examples such as the slow transformation of a volcanic island from barren rock to lush rain forest as initial plant colonizers create conditions favorable to other species; or the more rapid changes that occur after beavers dam a stream.

Science 186
Benchmarks for Science Literacy 121

d) *The flow of matter and energy.* Learners are able to account for environmental characteristics based on their knowledge of how matter and energy interact in living systems.

- Illustrate how energy for life is provided primarily by continual inputs from the sun, captured by plants through photosynthesis and converted into carbon-based molecules.
- Trace the flow of matter and energy through living systems, and between living systems and the physical environment. For example, account for the oxygen content of the atmosphere in terms of the interaction of plants, animals, and non-living matter in the carbon cycle.
- Explain how the abundance and distribution of living organisms are limited by the available energy and certain forms of matter such as water, oxygen, and minerals, as well as by the ability of the ecosystem to recycle dead organisms.

Understanding the Local Environment
In Grades 9-12

The final version of these guidelines will contain a section that provides guidance about what learners should know about their local environment. Proceeding through the grade levels, learners should both broaden and deepen their understanding of the systems that comprise their local environment.

In the space below, please list the basics of what learners should know by the end of 12th grade. Consider natural history and environmental knowledge as well as an understanding of how environmental services are provided (like waste disposal, energy production, etc.) and any other factors that you believe should comprise a 12th grade graduate's knowledge of the local environment.

Theme #2C
Humans and their Societies

Guidelines

a) *Individuals and groups.* Learners understand the influence of individual and group actions on the environment and comprehend how groups work to promote and balance interests.

Social Studies 121-126
Benchmarks for Science Literacy 142, 156, 160
Economics 3, 19-20

- Predict how the environmental effects of their personal actions might change over time. Consider variables such as technological advances, lifestyle changes, or taking on such roles as business owners, employees, or parents.
- Analyze how the actions of societal organizations such as businesses or community groups may have environmental consequences and other impacts that go beyond the intended aims of the group.
- Describe how particular groups meet or balance individual needs, group goals, and the common societal good, using conservation organizations, organizations of professionals in environment or resource management fields, community associations, or business groups as examples.

b) *Culture.* Learners understand cultural perspectives and dynamics and apply their understanding in particular situations.

Social Studies 111-112
Geography 195-196
Civics 103-105

- Analyze how cultural change and altered views of the environment are related. For example, discuss how the shift away from a largely rural society to a predominantly urban one may be connected with changing perceptions of the environment.

- Recognize diverse cultural views about humans and the environment. Anticipate ways in which data, events, or policy proposals might be interpreted by people from different cultural perspectives and frames of reference.
- Describe and compare different societal strategies (historical or contemporary) for adapting to environmental or social change while preserving and transmitting culture. For example, describe ways resource-dependent communities (those whose economies traditionally relied on activities such as mining or timber harvest) work to maintain their identities in the face of mine closures or declining timber harvests.

c) ***Political and economic systems.*** Learners understand how different political and economic systems account for, manage, and affect natural resources and environmental quality.

Economics 5-7, 19-20, 30-33
Social Studies 127-131
Benchmarks for Science Literacy 170
Geography 206-207
Civics 96-98, 110-120

- Explain the development of economic systems using the economic idea of scarcity and the geographic idea of uneven distribution of resources.
- Compare the U.S. political and economic systems with other types of systems, focusing on how the systems govern the use of natural resources, control production and consumption, and reflect environmental values.
- Evaluate the environmental and societal costs and benefits of allocating goods and services in different ways (e.g. through public or private sectors). For example, explain problems such as over fishing, overgrazing, and deforestation using the idea of the "tragedy of the commons," which can occur when a resource is commonly owned and openly accessible.
- Explain current and historical environmental issues in terms of political and economic ideas. For example, analyze the role of private property rights and the concept of general welfare in shaping decisions about land use in the United States.

d) *Global connections.* Learners are able to analyze global linkages in terms of political and economic systems. They also can conceive of themselves as part of this web of global connections.

- Explain regional and national economic specialization and international trade in terms of uneven distribution of resources.
- Describe global connections in systems such as the economy, transportation, and communication. Evaluate the effects of changes in these systems on communities and the environment at a global scale.
- Evaluate the connections among interests, decisions, and actions taken at the individual, community, regional, national, and global levels, and their effect on global issues such as human rights, economic development, health, resource allocation, and environmental quality. For example, examine the influence of factors such as consumer preferences, U.S. foreign policy, international treaties and governing bodies, international nongovernmental organizations, and corporate operations on agricultural practices in developing nations.

Geography 206-207, 210-211
Economics 11
Social Studies 136-138
Benchmarks for Science Literacy 178
Civics 121-126

e) *Change and conflict.* Learners understand how public processes for promoting and managing change and conflict work and affect the environment.

- Explain the complexities of public decision-making about the environment taking into account different types of costs and benefits, how costs and benefits may be unevenly distributed, and future or distant consequences.
- Evaluate the role of social, political, and economic institutions in the United States in managing change and conflict, especially regarding environmental issues. Account for the influence of institutions such as the legal system and property rights as well as organizations such as banks, nonprofit groups, corporations, and special interest groups.

Benchmarks for Science Literacy 163, 166, 173
Economics 19-20
Geography 210-211
Social Studies 124-129

- Evaluate the conditions and motivations that lead to conflict, cooperation, and change among individuals, groups, and nations, looking particularly at the effects of these forces on the control of natural resources. For example, examine international treaties and accords on whaling or commercial fishing.
- Evaluate various governmental and non-governmental strategies for promoting social change. For example, trace the strategies used by different groups to reduce energy use in the U.S.

Theme #2D
Environment and Society

Guidelines

a) *Human/environment interactions*. Learners understand that humans are able to alter the physical environment to meet their needs and that there are limits to the ability of the environment to absorb impacts or meet human needs.

Geography 212-215
Benchmarks for Science Literacy 56-57

- Evaluate ways in which technology has changed humans' ability to alter the environment and its capacity to support humans and other living organisms.
- Analyze specific examples of environmental change in terms of qualitative and quantitative costs and benefits for different groups of people and specific species or ecosystems.
- Describe factors that limit the physical environment's capacity to support particular types of human activity, using examples such as suburban development, flood control, or agricultural practices.
- Compare how people adapt to living in areas prone to natural hazards such as floods or earthquakes.

b) *Places.* Learners understand "place" as humans endowing a particular part of the Earth with meaning through their interactions with that environment.

Geography 190-196
Social Studies 118-120

- Analyze how places change over time as the physical environment changes and as human use and perceptions change. For example, examine the effects of the automobile and the interstate highway system on different places.
- Explain the importance of places to human identity. For example, discuss changes in land use and personal and community identity that occur in a rapidly growing town or city, or one in which the economy has stagnated.

- Describe how regions change over time, examining factors such as human migration and population change, technological change, environmental degradation, and seismic activity. For example, trace the causes of the desiccation of the Aral Sea and the changes it has prompted in that region of Russia.

Geography 216-218

c) ***Resources.*** Learners understand that the importance and use of resources change over time and vary under different economic and technological systems.

- Explain how resource distribution has affected human settlement patterns, exploring, for example, the effects of the discovery of gold on settlement in California and Alaska.
- Describe how changes in technology—such as the ability to harvest timber on steep slopes using helicopters or building technologies that allow the use of nontraditional or recycled materials —alter the use of resources.
- Evaluate resource use and related public policies, examining variables such as their impacts on the resource and short- and long-term economic effects. For example, anticipate the relationship between water use and the growth of a city like Las Vegas, Nevada which is in a desert area that receives only 4 inches of rainfall per year.
- Identify ways in which various resources can be recycled and reused. Evaluate the viability of recycling based on economic and technological factors, spatial variables such as distance from recycling facility to markets, and possible future developments. Discuss, for example, factors that influenced the development of the steel recycling industry in the United States.

d) *Technology.* Learners are able to examine the social and environmental impacts of various technologies and technological systems.

Benchmarks for Science Literacy 57, 181-207
Social Studies 132-135

- Explain how social and economic forces influence the direction of technological development, and how technological systems shape societal values and beliefs, perhaps looking at the ability to build large dams for water storage or hydropower, or the social impact of the first photos of the Earth from space.
- Using examples of particular technologies (such as genetic manipulation) and technological systems (such as modern agriculture or energy production and use), discuss the social and environmental costs, benefits, and risks associated with technologies through which humans shape and control their environment.
- Discuss ways in which people have attempted to lessen adverse environmental impacts through technological advances.

e) *Environmental issues.* Learners are familiar with a range of environmental issues at scales that range from local to national to global. They understand that these scales and issues are often linked.

Geography 221-222
Economics 30-34

- Evaluate the costs and benefits of particular policies and practices that affect the environment, looking at a range of people and values that are affected, and a variety of types of costs and benefits.
- Place local issues in the context of broader or larger-scale issues, drawing parallels, noting important similarities and differences, and using the broader issue to point to important dynamics or perspectives to be aware of locally.
- Identify links among issues, for example the relationships between traffic congestion, poor air quality, and suburban sprawl. Explain key relationships between technological, social, ecological, economic, and other aspects of issues.

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Environmental Issues in Ninth through Twelfth Grades

The final version of these guidelines will contain a series of examples of environmental issues that are appropriately examined at each grade level.

Please provide a couple of examples of issues that are appropriate at the 9-12 level. Add clarifying notes, if you wish, about how 9-12 learners can approach the issue.

Theme #3
Skills for Understanding and Addressing Environmental Issues

Theme #3A
Skills for Analyzing Environmental Issues

Guidelines

a) *Analyzing issues* — Learners are proficient in analyzing environmental issues and proposed solutions.

Social Studies 118-120
History 68-70
Geography 203-205, 210-211, 219-220

- Identify and clearly articulate environmental issues and their connections with other issues.
- Identify different perspectives on the issue and approaches to resolving it. Discuss assumptions and goals that underlie each position.
- Characterize the issue considering factors such as the pervasiveness of its effects, whether it is a long-term issue or one that is motivated by a sudden change or crisis, and whether is it unique to a particular area.
- Discuss ways in which others have analyzed the issue.

b) Sorting out the implications of issues — Learners identify the implications of specific environmental changes, conditions, and issues for human and ecological systems.

Social Studies 118-120
Geography 212-222

- Bring to bear historical perspectives, an understanding of the impacts of different technological developments, and a knowledge of similar issues in understanding the implications of an issue.
- Discuss the social, political, and economic implications of environmental issues. For example, trace the root causes of a community's solid waste problem and the effects of the problem and likely consequences of siting a landfill in different areas for different groups of people.
- Project the likely consequences for specific human and environmental systems of failure to resolve the issue.

c) ***Forming and evaluating personal positions*** — Students are able to identify, communicate, and justify their own views on environmental issues and alternative ways to address them.

- Justify their position based on an analysis of information from a variety of sources, personal beliefs and values, and clear reasoning.
- Evaluate personal beliefs and values using their understanding of social, economic, and environmental welfare as a gauge.
- Articulate elements of their own environmental ethic and discuss whether personal positions on issues are consistent with this ethic.
- Consider viewpoints that differ from their own and information that challenges their position.

Social Studies 121-123
Geography 219-222
History 70

Theme #3B
Skills for Investigating Environmental Issues

History 68-70
Social Studies 139-141

a) *Investigating issues* — Learners apply their research and analytical skills to investigate environmental issues ranging from local issues to those that are regional and global in scope.

- Define and clearly articulate issues to be investigated and identify connections with other issues.
- Identify key individuals and groups involved, and evaluate proposed solutions for the values and perspectives they represent.
- Identify important contextual elements that shape the issue and alternative courses of action. Use those elements to help identify relevant historical antecedents or contemporary parallels that may shed light on the selected issue. In studying the questions surrounding the preservation of natural areas in Guatemala, for example, students may look for similar issues in other developing nations, other regions where people maintain traditional or subsistence uses of the land, or other areas with similar governmental regimes.
- Investigate the issue as well as similar issues and proposals using secondary sources of information.
- Identify the need for original research on the issue in question and apply research methods from the natural and social sciences in investigating issues. For example, survey a community about an environmental issue using a random sample.

b) Identifying and evaluating alternative solutions and courses of action — Learners are able to identify action strategies that are likely to be effective in particular situations and for particular purposes.

Benchmarks for Science Literacy 230
History 70
Social Studies 139-141
English Language Arts 41

- Synthesize different perspectives, types of data, and means of analysis to propose solutions to environmental issues.
- Apply knowledge of functional relationships, modeling, and statistical analysis to evaluating issues and different approaches to resolving them. For example, do basic traffic flow analyses to project the likely affects of commercial developments at the outskirts of town and evaluate alternative solutions such as widening roads, providing bus service, or changing the location of the development. Predict other likely consequences of different approaches to resolving projected traffic problems associated with the new stores.
- Evaluate proposed solutions on the basis of their likely impacts on society and the environment, and on the basis of their likely effectiveness in resolving the issue. Use methods such as cost/benefit analysis, ethical analysis, environmental impact analysis, and risk analysis.
- Define and provide examples of citizen action appropriate to proposed solutions.

c) Working with flexibility, creativity, and openness — While environmental issues investigations can prompt deeply held views, students engage each other in peer review conducted in the spirit of open inquiry.

English Language Arts 31-33, 40-42, 44-45
Science 173-176
Benchmarks for Science Literacy 287

- Question, offer alternative explanations, and defend interpretations in group discussions.
- Understand and explain the importance of such characteristics as honesty, openness, and suspending judgment in the process of building knowledge.
- Discuss when and how characteristics such as openness and decisiveness are valuable in addressing environmental issues.

Theme #3C
Decision-making and Citizenship Skills

Guidelines

a) *Evaluating the need for citizen action* — Learners are able to decide whether action is needed in particular situations, and whether they should be involved.

Geography 55

- Evaluate whether action is warranted in specific situations, accounting for factors such as available evidence about the issue and proposed solutions; the scale of the issue; legal, social, economic, and ecological consequences; and alternatives to citizen action.
- Evaluate whether personal involvement in particular actions is warranted, considering factors such as their own values, skills, resources, and commitment.
- Communicate decisions clearly, articulating well-reasoned arguments supporting their views and decisions.

b) *Planning and taking action* — Learners know how to plan for action based on their research and analysis of an environmental issue. If appropriate, they take actions that are within the scope of their rights and consistent with their abilities and responsibilities as citizens.

Social Studies 139-141
Civics and Government 6, 128-132

- Develop plans for individual and collective action based on knowledge of a range of citizen action strategies and the results of investigations of a particular environmental issue. Include clear reasons and goals for action.
- Develop action plans based on an understanding of the complexity of the issue. Set realistic goals and include measures of success consistent with learners' abilities.
- Decide whether their plan should be implemented immediately or at another time, modified, or abandoned; and carry through with action when appropriate.

History 70
Social Studies 139-141

c) ***Evaluating the results of actions*** — Learners understand that civic actions have consequences. They are able to evaluate the effects of their own actions and actions taken by other individuals and groups.

- Analyze the influence and effectiveness of historical decisions, policies, and actions, working with ideas such as the common good, environmental quality, quality of life, and democratic ideals such as equality, liberty, and justice.
- Analyze their own actions, evaluating apparent effects in terms of their goals and ethics and broader societal goals. Develop a "lessons learned" document or presentation.
- Account for some of the difficulties they encounter in evaluating the results of their actions.

Theme #4
Personal and civic responsibility

Guidelines

a) *Understanding societal values and principles* — Learners know how to analyze the influence of shared and conflicting societal values.

- Identify shared political values and principles that unite U.S. citizens and analyze conflicting views about their meaning and application. For example, examine conflicting views about how to protect general welfare and private property rights in a specific land-use decision where a lawsuit has been filed alleging a "taking" of private property rights by the government.
- Describe different belief systems operating within the United States and analyze their influence on social change, environmental policy, and other aspects of society.
- Analyze how societal institutions such as banks, nonprofit organizations, corporations, lobbying groups, government agencies, and the courts embody and perpetuate certain societal values and principles.
- Describe and suggest ways that individuals can work to change how societal institutions function.

English Language Arts 44
Economics 19-20
Civics 105-109
Social Studies 124-129, 139-141

b) ***Recognizing citizens' rights and responsibilities*** — Learners understand the importance of exercising the rights and responsibilities of citizenship.

Social Studies 20, 139-141
Civics 128-137

- Evaluate conflicts between individual rights and other societal interests such as a healthy environment, and discuss when individuals' civic obligations require them to subordinate their personal interests or desires to the public good.
- Explain the importance and evaluate the usefulness of civic dispositions such as trust, patience, self-discipline, respect, and open-mindedness to individuals and to society.
- Explain the influence of citizen action and public opinion on particular policy decisions that affect the environment.
- Reflect on the impact of citizen participation—particularly learners' own—on public concerns and values such as environmental quality and quality of life.

Social Studies 124-126

c) ***Recognizing efficacy*** — Learners possess a realistic self-confidence in their effectiveness as citizens.

- Evaluate the extent to which individual and group action creates change, meets individual needs, and promotes the common good.
- Recognize that they, both individually and collectively, are able to help resolve environmental problems and issues. This sense of efficacy extends into the range of communities of which learners see themselves as members.

Civics 131-132

d) *Accepting personal responsibility* — Learners understand that their actions can have broad consequences and accept responsibility for recognizing those effects and changing their actions when necessary.

- Evaluate the effects of their actions (and the actions of the larger social groups of which they are part) on the environment, other humans, and other living things.
- Explain ways in which the decisions of one generation create opportunities and impose constraints for future generations. Illustrate this idea with examples from the past, and incorporate this concern into their analyses of issues.
- Evaluate the importance of fulfilling personal responsibilities for themselves, society, and the environment.
- Demonstrate a willingness to work individually and collectively toward the resolution of environmental issues and to participate thoughtfully and effectively in environmental decision-making.

Appendix A

Antecedents to the Development of the Learner Guidelines Framework

The Learner Guidelines in Context

The National Project for Excellence in Environmental Education, sponsored by the North American Association for Environmental Education (NAAEE), was initiated in 1993 to facilitate the development of a model set of guidelines for environmental education. As such, it joins the many standards projects for such disciplines as Mathematics, English Language Arts, Geography, Science, Civics, and History developed in response to the Goals 2000 process. Although the development of Environmental Education Guidelines can and should be seen as an enterprise that serves the field of the environmental education as a means for articulating some core concepts, skills, and dispositions, they have also been developed as a concerted effort to demonstrate the essential link between environmental education and the traditional disciplines and in turn, to education reform efforts.

Education Reform and the Standards Development Movement

The current push toward education reform in the U.S. was heralded by the publication, in 1983, of *A Nation at Risk*. Pointing to declining test scores, poorly prepared high school graduates, declining enrollment in science and mathematics, low academic achievement in comparison to many European and Japanese students, and low levels of literacy, significant questions concerning the quality of the American education system were raised. Following the publication of *A Nation at Risk*, it became common to call into question the very structure of American Education.

A decade long move toward national education reform received its highest level of governmental recognition at the 1989 national education summit in Charlottesville. At the summit, a bipartisan group of the nation's governors hammered out national goals for education with the Bush White House. These broadly formulated goals set out an agenda for education for the year 2000. With the passage of the Goals 2000: Educate America Act in 1994 the eight goals became official national policy, guiding numerous activities in and out of the federal government. Of particular importance for the work before us are Goals #3 and Goal #4. Goal 3: Student Achievement and Citizenship states that "by the year 2000 American students will leave grades four, eight, and twelve having demonstrated competency in challenging subject matter, including English, mathematics, science, history, and geography; and every school in america will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our modern economy." Goal #4: Science and Mathematics states that "by the year 2000, U.S. students will be first in the world in science and mathematics achievement."

Both Goal #3 and Goal #4 set the stage for the development of a range of voluntary, national standards for the core disciplines (see Appendix B for a listing of a sampling of these standards documents). Although it must be emphasized that these standards are voluntary,

they have been designed to provide state and local education leaders guidance in the development of locally appropriate academic benchmarks.

Building from a Rich History

Environmental education enjoys a rich history and literature. These Guidelines have been developed, over the last four years with the input of literally thousands of teachers, school administrators, environmental educators, scientists, and parents as well as the input from a variety of professional organizations and government agencies. But from the very inception of the project, the development of the Guidelines has used the existing environmental education frameworks, definitions, and models as a foundation. The field as a whole owes a great deal to those who have struggled to create these documents, and most certainly the Guidelines owes its very structure to them. Each brings a different set of assumptions and priorities, yet the commonalities that in essence defines the practice of environmental education are considerable.

I. Developing a Framework for the Guidelines

Any discussion of the foundations of environmental education would be remiss if it did not acknowledge the significant contributions of the *Belgrade Charter* (1975) and the *Tbilisi Declaration* (1977). These two documents furnish an internationally accepted blueprint for environmental education. The *Belgrade Charter* set forth a goal for environmental education, and such, provides a widely endorsed vision statement which can be used as a guidepost:

> The goal of environmental education is to develop a world population that is aware of, and concerned about, the environment and its associated problems, and which has the knowledge, skills, attitudes, motivations, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

The *Tbilisi Declaration* further delineated a definition and a set of goals for environmental education:

Definition:

> Environmental education is a process aimed at developing a world population that is aware of, and concerned about, the total environment and its associated problems, and which has the knowledge, attitudes, skills, motivation, and commitment to work individually and collectively toward solutions of current problems and the prevention of new ones.

The goals of environmental education are:

> To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;
>
> To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;
>
> To create new patterns of behavior of individuals, groups and society as a whole towards the environment.

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Finally, the *Tbilisi Declaration* outlined five categories of objectives for environmental education:

> Awareness - to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.
>
> Knowledge - to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.
>
> Attitudes - to help social groups and individuals acquire a set of values and feels of concern for the environment and the motivation for actively participating in environmental improvement and protection.
>
> Skills - to help social groups and individuals acquire the skills for identifying and solving environmental problems.
>
> Participation - to provide social groups and individuals with an opportunity to be activity involved at all levels in working toward resolution of environmental problems.

Much of the work in environmental education has been guided by the *Belgrade Charter* and the *Tbilisi Declaration*. With the evolution of the field, these guiding principles have been researched, critiqued, revisited, and expanded. As such, the Learner Guidelines must draw upon our best thinking to date. To further examine the foundations of environmental education, frameworks developed since *Tbilisi* will be divided into those: based on research or a synthesis of the research literature; created as conceptual frameworks for curricula; and developed as part of previous standards or criteria development projects. To re-create some of the historical logic of the field, the models will be presented in chronological order within each category.

II. Frameworks/Models Based on EE Literature

Since the publication of the *Tbilisi Declaration* in 1977, the field has continued to mature, maintaining the declaration's intent, but also elaborating on and fine tuning its design. Although the environmental education model proposed by Stapp and Cox (1974) predates *Tbilisi*, it is important to include here because of the central role it played in the development of the *Tbilisi Declaration*. The work by Hungerford, et. al. (1980), proposing goal levels for EE curriculum development, is closely tied to the *Tbilisi* objectives. The four goal levels were submitted to a content validity expert panel to judge their congruence with the five *Tbilisi* objectives. In recent years, the focus of much scholarly work in EE has been on describing the precursors of responsible environmental citizenship and environmental literacy. That is, what are the types of knowledge, skills and dispositions that describe the environmentally literate citizen. As such, the proposed frameworks offered by Iozzi, et. al. (1990), Marcinkowski (1991), Wisconsin Center for Environmental Education (1992), Roth (1992), and the EE Literacy Consortium (1994) are all based in a synthesis of this research and foundations literature. Finally, the important influence of issues surrounding sustainable development on EE thinking is considered with the inclusion of a framework for sustainable development education published in Canada (1994).

A. **Stapp, W.B. and Cox, D.A. (1974) Environmental Education Model.**

I. Philosophy and Concepts

An environmental education program should assist the learner in understanding the basic spaceship earth philosophy which would serve as an 'umbrella' of thought and ethic for the entire program. The spaceship earth philosophy has been divided into five basic concepts: ecosystems, population, economics and technology, environmental decisions, and environmental ethic. These concepts encompass the awareness, knowledge, and understanding of the living and non-living world and their complex interactions; the social, economic, political and aesthetic influences of the populations of people; the need for, and processes of decision making; and development of an environmental ethic which would motivate the learner to adopt to a life style compatible with environmental quality.

II. The Processes

A. The Skills of Problem solving

Since the environmental education model is based on student involvement, problem solving skills are essential to developing and carrying out action plans. ...The eight problem solving skills:

1. Recognizing environmental problems
2. Defining environmental problems
3. Listening with comprehension
4. Collecting information
5. Organizing information
6. Analyzing information
7. Generating alternative solutions
8. Developing a plan of action

B. Clarifying Values

The values clarification approach helps students become aware of personal beliefs, attitudes, values and behavior which they prize and are committed to both in and out of the classroom. This process assists students in considering alternative solutions and the implications of each alternative. ... Values clarification is of major importance in making rational environmental decisions every day of a person's life, and must be a basic part of every environmental education program.

C. Community Problem solving

Students need to be able to apply learned skills in both valuing and problem solving in an issue that is meaningful to them - a problem that directly affects them either at home, or at school, or in the local community.

III. The teaching-Learning Models

There is no single teaching model that all students will respond favorably toward under all circumstances. ... It is important for a teacher to asses his/her personal skills and the situation and then blend teaching models in an effort to achieve the best learning environment. ... The role of the teacher would be to create a learning environment, assist students in acquiring information, provide guidance to the student, and to participate with the student in the learning process.

IV. Emphasis of Program at Different Age Levels

Environmental education activities at each grade level should focus on the feeling (affective), knowing (cognitive) and skill-behavior domains. Emphasis in the early years, however, should be on awareness and feelings and in later years on knowledge and skill-behavior. The learner should also be provided with opportunities to explore his immediate environment with all of his senses -- sight, hearing, smell, touch and taste. The learner should be exposed to a variety of physical and social environments in order to have experiences to judge the quality of his immediate environment.

B. Hungerford, H.R., Peyton, R.B., and Wilke, R. (1980) Goals for Curriculum Development in Environmental Education.

GOAL LEVEL I: The Ecological Foundations Level

Upon completion of instruction in environmental education, the learner should be expected to be able to...

1. ... communicate and apply the major ecological concepts including those focusing on individuals, species populations, communities, ecosystems, biogeochemical cycles, energy production and transfer, interdependence, niche, adaption, succession, homeostasis, and man as a ecological variable.
2. ... apply a knowledge of ecological concepts to the analysis of environmental issues and identify important ecological principles involved.
3. ... apply a knowledge of ecological concepts in predicting the ecological consequences of alternative solutions to environmental problems.
4. ...understand the principles of ecology in order to identify, select and utilize appropriate sources of scientific information in a continuing effort to investigate, evaluate and find solutions for environmental issues.

GOAL LEVEL II: The Conceptual Awareness Level

5. ...understand and communicate how man's cultural activities (e.g., religious, economic, political, social and others) influence the environment from an ecological perspective.
6. ...understand and communicate how an individual's behaviors impact on the environment from an ecological perspective.
7. ...identify a wide variety of local, regional, national and international environmental issues and the ecological and cultural implications of these issues.

8. ... identify and communicate the viable alternative solutions available for remediating crucial environmental issues as well as the ecological and cultural implications of these various solutions.
9. ... understand the need for environmental issue investigation and evaluation as prerequisite to sound decision making.
10. ... understand the roles played by differing human beliefs and values in environmental issues and the need for personal values clarification as an important part of environmental decision making.
11. ... understand the need for responsible citizenship action in the solution of environmental issues.

GOAL LEVEL III: The Investigation and Evaluation Level

12. ... apply the knowledge and skills needed to identify and investigate issues (using both primary and secondary sources of information) and synthesize the data gathered).
13. ... demonstrate the ability to analyze environmental issues and the associated value perspectives with respect to their ecological and cultural implications.
14. ... demonstrate the ability to identify alternative solutions for important issues and the value perspectives associated with these solutions.
15. ... demonstrate the ability to evaluate alternative solutions and associated value perspectives for important issues with respect to their ecological and cultural implications.
16. ...demonstrate the ability to identify and clarify personal value positions related to important environmental issues and their associated solutions.
17. ... demonstrate the ability to evaluate, clarify, and change value positions in light of new information.

GOAL LEVEL IV: the Issue Resolution Skill Level

18. ... demonstrate a competence with a variety of citizenship action skills from the following categories of skills: persuasion, consumerism, political action, legal action, and ecomanagment.
19. ... evaluate selected actions in light of their ecological and cultural implications.
20. ... demonstrate the ability to apply one or more citizenship action skill for th purpose of resolving or helping to resolve one or more environmental issues.

C. **Iozzi, L. , Laveault, D., Marcinkowski, T. (1990) Assessment of Learning Outcomes in Environmental Education**

Organization of Learning Outcomes According to Taxonomies of Educational Objectives

COGNITIVE DOMAIN

Knowledge: of ecology, environmental problems and issues, and environmental action strategies

Skills for dealing with action strategies: including identification, investigation, and analysis of issues

Skills for dealing with action strategies: including selecting appropriate action strategies, creating an action plan, evaluating an action plan, and implementing an action plan

AFFECTIVE DOMAIN

Environmental sensitivity or appreciation: including 'the characteristics that result in an individual viewing the environment from an empathetic perspective' (Peterson, 1982)

Attitudes: towards pollution, technology, economics, conservation, and environmental action

Values: a preference for selected means and ends; values such as a healthy environment and a peaceful world

Moral reasoning: making decisions and judgments about environmental issues according to one's own sense of morality

Ethics: involving the evaluation of a personal world view which reflects a balance between the quality of life and the quality of the environment

RESPONSIBLE ENVIRONMENTAL BEHAVIOR

Active participation aimed at solving problems and resolving issues: environmentally sound consumer purchasing, methods for conserving resources, assisting with the enforcement of environmental regulations, using personal and interpersonal means to encourage environmentally sound practices, and encouraging environmentally sound policies and legislative initiatives.

LOCUS OF CONTROL

Individual's sense that he or she can manifest some influence upon or control over the outcomes of a specific activity

ASSUMPTION OF PERSONAL RESPONSIBILITY

Recognition that one's negative behavior has a negative effect on the environment and, likewise, one's positive behavior can have potentially positive effects on the environment

Acceptance of personal responsibility for negative environmental effects or impacts, and for one's own role in helping to resolve environmental impacts and issues

Willingness to help correct negative environmental impacts, and a concomitant willingness to help resolve environmental impacts and issues.

D. **Marcinkowski, T. (1991) The Relationship Between Environmental Literacy and Responsible Environmental Behavior in Environmental Education.**

Environmental literacy involves:

a. An awareness and sensitivity toward the environment.
b. An attitude of respect for the natural environment, and of concern for the nature and magnitude of human impacts on it.
c. A knowledge and understanding of how natural systems work, as well as of how social systems interface with natural systems.
d. An understanding of the various environmentally-related problems and issues (local, regional, national, international, and global).
e. The skills required to analyze, synthesize, and evaluate information about environmental problems/issues using primary and secondary sources, and to evaluate a select problem/issue on the basis of evidence and personal values.
f. A sense of personal investment in, responsibility for, motivation to work individually and collectively toward the resolution of environmental problems/issues.
g. A knowledge of strategies available for use in remediating environmental problems/issues.
h. The skills required to develop, implement and evaluate single strategies and composite plans for remediating environmental problems/issues.
I. Active involvement at all levels in working toward the resolution of environmental problems/issues.

E. **Wisconsin Center for Environmental Education (1992), University of Wisconsin, Steven's Point**

COGNITIVE OUTCOMES

Knowledge of Ecological Principles

Individuals, Populations, and Communities (habitats, niches, and adaptations; food chains, food webs; population dynamics; population and community interactions)

Change and Limiting Factors (change as a natural process; biotic and abiotic limits to growth, size, and distribution of populations)

Energy Flow (sun as primary source, other sources and forms of energy; transfer and energy through living systems; first and second laws of energy - conservation of energy, entropy; need for a consistent source of energy by systems and individuals; photosynthesis and respiration

Biogeochemical Cycling (conservation of matter, nutrient and materials cycling; hydrologic cycle

Ecosystems and Biodiversity (importance of biodiversity; interdependence of organisms; ecosystems

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Knowledge of Environmental Problems and Issues

Air Quality (ozone depletion; global warming; acid deposition; sir pollution

Water Quality and Quantity (water pollution; use and management

Soil Quality and Quantity (soil depletion and pollution; use and management)

Wildlife and Habitat (habitat and biodiversity loss; use and management)

Energy (sustainable and non-renewable; consumption)

Human Population and Health (overpopulation; environmental health hazards)

Waste (solid waste; hazardous wastes)

Knowledge of Environmental Issue Investigation and Action Strategies

Knowledge of strategies used to investigate environmental problems and issues

Knowledge of appropriate action strategies for the prevention or resolution of environmental problems and issues

AFFECTIVE OUTCOMES

Environmental Sensitivity/Awareness

Positive Attitudes and Values for the Prevention and Remediation of environmental Problems and Issues Regarding: Air Quality; Water Quality and Quantity; Soil Quality and Quantity; Wildlife and Habitat; energy; Human Population and Health; Waste

DETERMINANTS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR

Locus of Control

Assumption of Personal Responsibility

ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

Ecomanagement; Economic Action; Persuasion; Political Action; Legal Action

For a literature review that supports the development of the above framework see Quale (1993).

E. **Roth, C. (1992) Environmental Literacy: Its Roots, Evolution and directions in the 1990's**

NOMINAL ENVIRONMENTAL LITERACY

Knowledge Strand - Nominally environmentally literate individuals are familiar with:

The nature of the basic components of elemental systems (e.g., living and non-living things, requirements for life).

Types and examples of interactions between humans and nature.

Basic components of societal systems.

Affective Strand - have affective sensitivities about:

Appreciation of both nature and society.

Elementary sensitivity and empathy for both nature and society.

Elemental perceptions of points of conflict between nature and society.

Skill Strand - have skills of:

Identifying and defining problems.

Recognizing issues surrounding identified problems or proposed solutions (e.g. latent and visible conflicts).

Behavior Strand - demonstrate:

Familial, school and you organization activities and habits aimed at maintenance of environmental quality.

Responding and coping behaviors.

FUNCTIONAL ENVIRONMENTAL LITERACY

Knowledge Strand - The functional environmentally literate citizen, in addition to the knowledge of the nominally literate, has knowledge of and understanding of a number of ecological, economic, geographic, religious, educational and political processes and understanding of the effects/impacts of humans on natural systems, including (abbreviated listing):

Population dynamics
Interactions
Interdependence
Thinking in terms of time frames or scales

Skill Strand - The functionally environmentally literate demonstrate basic skills in analyzing problems and issues and conducting investigations of problems and issues using primary and secondary resource/strategies such as (abbreviated listing):

Identifying environmental issues.
Seeking historical background of issues.
Investigating environmental issues.
Evaluating sources of information.
Analyzing environmental issues from various perspectives.
Applying ecological concepts to predicting probably ecological consequences.
Identifying alternative solutions and value perspectives
Evaluating alternative solutions.
Conducting basic risk analysis.
Identifying and clarifying his/her value positions.
Examining issues from local, national, regional, and international points of view.
Thinking in terms of systems.
Demonstrating ability to forecast, to think ahead, plan

Affect Strand - the functionally environmentally literate demonstrate such basic affects, attitudes and values as:

Identification with, and feelings of concern for, both society and the environment.

Willingness to recognize and choose among differing value perspectives associated with problems and issues.

Internal locus of control.

Treating public and private property with equal respect.

Sense of stewardship.

Behavior Strand - the functionally environmentally literate moves to action through selected lifestyle activities/behaviors and community/organizational behaviors demonstrated by:

Taking action positions and actions based on best available knowledge.

Taking individual and/or group action through: persuasion, consumerism, political action, legal action, ecomanagement

OPERATIONAL ENVIRONMENTAL LITERACY

Skill Strand - Skills involved with evaluating problems and issues on the basis of available evidence (facts) and personal values and skills used in planning, implementing, and evaluating solutions, including:

Using the process skills of scientific inquiry:
using ability to forecast, to think ahead, plan

using ability to separate number, quantity, quality, and value
imagining
connecting
valuing and value analysis
using primary and secondary sources of information
using ability to separate fact from opinion
determining the roles played by differing human beliefs and values in environmental issues

Affect Strand - Affects, attitudes and values, that indicate a valuation of both nature and society, a sense of investment in and responsibility for the resolution of problems and issues along with a respect for both nature and society and a willingness to participate in, and show a sense of efficacy toward the resolution of problems and issues including (abbreviated listing):

Awareness of and sensitivity to the total environment and its allied programs

Motivation to actively participate in environmental improvement and protection

Taking into account historical perspectives while focusing on current and potential environmental situations

Strong internal locus of control

Personal responsibility: recognition of impacts of personal behavior; acceptance of personal responsibility for the impacts; willingness to help correct or avoid negative impacts

Behavior Strand - Actions that demonstrate leadership in working toward the resolution of problems and issues including:

Evaluating actions with respect to their impact on quality of life and environment

Providing verbal commitments

Working to maintain biological and social diversity

Continually examining and reexamining the values of the culture

Making decisions based on beneficence, justice, stewardship, prudence, cooperation, and compassion

G. **Environmental Education Literacy Consortium (Hungerford, H.; Volk, T.; Wilke, R.; Champeau, R.; Marcinkowski, T.; May, T.; Bluhm, B.; and McKeown-Ice, R.) Environmental Literacy Framework (1994)**

COGNITIVE DIMENSIONS (KNOWLEDGE AND SKILLS)

A. Knowledge of ecological and socio-political foundations

B. Knowledge of and ability to identify, analyze, investigate and evaluate environmental problems and issues.
C. Knowledge of and ability to apply environmental action strategies seeking to influence outcomes of environmental problems and issues
D. Ability to develop and evaluate an appropriate action plan for the resolution of environmental problems or issues

AFFECTIVE DIMENSIONS

A. Recognition of the importance of environmental quality and the existence of environmental problems and issues
B. Empathic, appreciative and caring attitudes toward the environment
C. Willingness to work toward the prevention and/or remediation of environmental problems and issues

ADDITIONAL DETERMINANTS OF ENVIRONMENTALLY RESPONSIBLE BEHAVIOR

A. Belief in their ability, both individually and collectively, to influence outcomes of environmental problems and issues
B. Assumption of responsibility for personal actions that influence the environment

PERSONAL AND/OR GROUP INVOLVEMENT IN ENVIRONMENTALLY RESPONSIBLE BEHAVIORS

A. Ecomanagement - e.g. actions such as using a more energy efficient form of transportation, reducing consumption of energy or water, improving wildlife habitat, recycling, etc.
B. Economic/consumer action - e.g., purchasing products in returnable/reusable containers, avoiding purchase of excess packaging, avoiding items with toxic by-products, providing financial support to an environmental organization, boycotting products considered to be damaging to the environment, etc.
C. Persuasion - e.g., using informal discussion to encourage another to support a positive environmental position or action, distributing "pro-environment" literature, signing a petition, encouraging another individual or group to stop some kind of destructive behavior, writing a letter to a person/group/company to stop and action that has negative environmental consequences, giving a speech, etc.

D. Political action - e.g., writing letters or speaking directly to elected officials on behalf of an environmental issue, supporting by time or finances a candidate or lobbying group based upon an environmental issue, running for or serving in an official capacity with the intent of supporting pro-environmental positions or actions, etc.
E. Legal action - e.g. reporting violations in pollution/littering, fishing, trapping or hunting laws or plant or animal collecting to the authorities, working with authorities to patrol areas for enforcing environmental laws, providing information or testimony at a legal hearing or participating in a lawsuit

against a person/group who has violated a law aimed at protecting the environment, etc.

H. **Learning for a Sustainable Future, Developing a Cooperative Framework for Sustainable Development Education (1994)**

EDUCATION FOR A SUSTAINABLE FUTURE: The Knowledge, Skills and Values Needed

Knowledge Needed:

1. The planet earth as a finite system and the elements that constitute the planetary environment.
2. The resources of the earth, particularly soil, water, minerals, etc., their distribution and their role in supporting living organisms.
3. The nature of ecosystems and biomes, their health and their interdependence within the biosphere.
4. The dependence of humans on the environmental resources for life and sustenance.
5. The sustainable relationship of native societies to the environment.
6. The implications of resource distribution in determining the nature of societies and the rate and character of economic development.
7. Characteristics of the development of human societies including nomadic, hunter-gatherer, agricultural, industrial and post-industrial, and the impact of each on the natural environment.
8. The role of science and technology in the development of societies and the impact of these technologies on the environment.
9. Philosophies and patterns of economic activity and their different impacts on the environment, societies and cultures.
10. The process of urbanization and the implications of de-ruralization.
11. The interconnectedness of present world political, economic, environmental and social issues.
12. Aspects of differing perspectives and philosophies concerning the ecological and human environments.
13. Cooperative international and national efforts to find solutions to common global issues, and to implement strategies for a more sustainable future.
14. The implications for the global community of the political, economic and socio-cultural changes needed for a more sustainable future.
15. Processes of planning, policy-making and action for sustainability by governments, businesses, non-governmental organizations and the general public.

Skills Needed:

1. Frame appropriate questions to guide relevant study and research.
2. Define such fundamental concepts as environment, community, development and technology, and apply definitions to local, national and global experience.
3. Use of range of resources and technologies in addressing questions.
4. Assess the nature of bias and evaluate different points of view.

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5. Develop hypotheses based on balanced information, crucial analysis and careful synthesis, and test them against new information and personal experience and beliefs.
6. Communicate information and viewpoints effectively.
7. Work towards negotiated consensus and cooperative resolution of conflicts.
8. Develop cooperative strategies for appropriate action to change present relationships between ecological preservation and economic development.

Values Needed:

1. An appreciation of the resilience, fragility and beauty of nature and the interdependence and equal importance of all life forms.
2. An appreciation of the dependence of human life on the resources of a finite planet.
3. An appreciation of the role of human ingenuity and individual creativity in ensuring survival and the search for appropriate and sustainable progress.
4. An appreciation of the power of human beings to modify the environment.
5. A sense of self-worth and rootedness in one's own culture and community.
6. A respect for other cultures and a recognition of the interdependence of the human community.
7. A global perspective and loyalty to the world community.
8. A concern for disparities and injustices, a commitment to human rights, and to the peaceful resolution of conflict.
9. An appreciation of the challenges faced by the human community in defining the processes needed for sustainability and in implementing the changes needed.
10. A sense of balance in deciding among conflicting priorities.
11. Personal acceptance of a sustainable lifestyle and a commitment to participation in change.
12. A realistic appreciation of the urgency of challenges facing the global community and the complexities that demand long-term planning for building a sustainable future.
13. A sense of hope and a positive personal and social perspective on the future.
14. An appreciation of the importance and worth of individual responsibility and action.

III. CONCEPTUAL FRAMEWORKS FOR CURRICULUM MATERIALS

The form environmental education takes in practice is based heavily upon the curriculum materials that are available to those "out in the field" whether as teachers, naturalists, volunteer instructors or museum curators. The conceptual or curriculum frameworks direct the writing of individual lessons as well as the overall organization of the materials. Consequently, looking to how EE has been put into practice is an essential component of the development of a model or framework for EE standards. Although there is a plethora of curricula available, a small number of nationally recognized examples were selected for this review.

A. **Project WILD (1986)**

CONCEPTUAL FRAMEWORK

I. Awareness and Appreciation of Wildlife
A. Humans and wildlife have similar basic needs
B. Humans and wildlife share environments.
C. Humans and wildlife are subject to many of the same environmental conditions.
D. Humans have far greater ability to alter or adjust to environments than does wildlife; thus, humans have a responsibility to consider effects of their activities on other life forms.

II. Human Values and Wildlife
A. Wildlife has aesthetic and spiritual values.
B. Wildlife has ecological and scientific values.
C. Wildlife has social and political values.
D. Wildlife has commercial and economic values.
E. Wildlife has consumptive and non-consumptive recreational values.

III. Wildlife and Ecological Systems
A. Each environment has characteristic life forms.
B. All living elements of an ecological system are interdependent.
C. Variation and change occur in all ecological systems.
D. Adaptation is continuous within all ecological systems.
E. Living things tend to reproduce in numbers greater than their habitat can support.
F. Each area of land or water, and ultimately the planet, has a carrying capacity of plants and animals.

IV. Wildlife Conservation
A. Management of resources and environments is the application of scientific knowledge and technical skills to protect, preserve, conserve, limit, enhance, or extend the value of a natural resource, as well as to improve environmental quality.
B. Wildlife is one of our basic natural resources, along with water, air, minerals, soil, and plant life.
C. Good habitat is the key to wildlife survival.
D. Wildlife resources can be managed and conserved.
E. Wildlife conservation practices depend on a knowledge of natural laws and the application of knowledge from many disciplines.
F. In the U.S., wildlife is considered to be a public resource. Ownership of land or water alone does not secure ownership of wildlife on that land or in that water as it does in some other countries.

V. Cultural and Social Interaction with Wildlife
A. Human cultures and societies, past and present, affect and are affected by wildlife and its habitat.
B. Societies develop programs and policies relating to wildlife and its habitat through a variety of social mechanisms.

VI. Wildlife Issues and Trends: Alternatives and Consequences
A. Human impacts on wildlife and its habitat are increasing worldwide.
B. Issues involving wildlife and its habitat are a product of social and cultural trends.
C. Current wildlife issues and trends are complex and involve alternatives and consequences.
D. Many problems, issues, and trends involving wildlife in other parts of the world are similar to those in this country.

VII. Wildlife, Ecological Systems, and Responsible Human Actions
A. Each person as an individual and as a member of society affects the environment.
B. Responsible environmental actions are the obligation of all levels of society, starting with the individual.

B. Essential Learnings in Environmental Education (1990)

NATURAL SYSTEMS
General: Environment, Earth, Biosphere
Abiotic Components: Energy, Atmosphere, Land & Soil, Water
Biotic Components: Plant, Animal
Processes: Weather & Climate, Biogeochemical Cycles, Evolution and Extinction
Biological Systems: Ecosystems, Food Chains & Webs, Community, Population, Habitat & Niche

RESOURCES
Natural Resources: Distribution & Consumption, Management & Conservation, Sustainable Development
Abiotic Resources: Energy & Minerals, Water, Land & Soil
Biotic Resources: Forests, Wildlife & Fisheries, Biodiversity
Degradation of Resource Base: Limits to Systems, Pollution

HUMAN SYSTEMS
Humans and Environment: Humans as part of environment, human adaptation to environment, Human influence upon environment, population factors
Technological systems: Agriculture, Settlements, Manufacturing & Technology
Social Systems: Economic systems, Sociopolitical Systems, Culture & Religion
Environmental Awareness and Protection: Values & Ethics, Education & Communication, Participation/Voluntary Action, Legislation & Enforcement

C. Project Learning Tree Environmental Education Activity Guide (1993)

Diversity
Diversity in Environments
Diversity of Resources & Technologies
Diversity Among and within Societies and Cultures
Interrelationships
Environmental Interrelationships
Resources & Technological Interrelationships
Societal and Cultural Interrelationships

Systems
Environmental Systems
Resource Management & Technological systems
Systems in Society and Culture

Structure & Scale
Structures & Scale in Environments
Structure & Scale in Resources & Technology
Structure & Scale in Societies & Culture

Patterns of Change
Patterns of Change in the Environment
Patterns of Change in Resource and Technologies
Patterns of Change in Society and Culture

D. **Project WET Curriculum & Activity Guide (1995)**

Conceptual Framework

Water has unique physical and chemical characteristics.
Water is essential for all life to exist.
Water connects all Earth systems.
Water is a natural resource.
Water resources are managed.
Water resources exist within social constructs.
Water resources exist within cultural contexts.

Affective Framework

People's awareness of and sensitivity toward water and water-related concepts and issues.

People's attitudes (opinions, likes, dislikes) toward water and water-related concepts and issues.

People's values (consideration of worth, need to cherish, importance) toward water and water-related concepts and issues.

People's behavior toward and expression of water and water-related concepts and issues, influenced by awareness and sensitivity, attitudes, and values.

Skills Framework

Gathering information.
Organizing information.
Analyzing information.
Interpreting information.
Applying learned information.
Evaluating application of learned information.
Presenting evidence of learning from application and evaluation.

E. **Biodiversity Basics (draft, 1998)**

What is biodiversity?

The concepts within this theme provide students with a fundamental knowledge of biodiversity and help students appreciate the diversity of life that exists in the world. These concepts also help students understand the characteristics of living systems and that the environment is made up of systems nested within larger systems.

Why is biodiversity important?

Concepts in this theme can help students investigate how biodiversity affects their lives and supports all life on Earth. Recognizing the importance of biodiversity increases students' awareness of why and how people's actions affect biodiversity and why it's important to maintain and restore biodiversity.

What is the status of biodiversity?

Concepts in this theme can help students understand the status of biodiversity and why biodiversity is declining around the world. By learning about the causes and consequences of biodiversity loss, students will be able to participate in maintaining biodiversity in the future.

How can we manage biodiversity in the future?

Concepts in this theme help students identify ways to ensure that biodiversity will be maintained for future generations. For students to willingly and effectively take action to protect biodiversity, they must have a thorough understanding and appreciation of what biodiversity is, why it is important, why we are losing it, and what people can do to get involved. Students should also begin to understand the links among ecological integrity, social equity, and economic prosperity as three components of a sustainable society.

Skills Framework

Questioning and analysis skills.
Environmental issues investigation skills.
Decision and action skills.
Personal and civic responsibility.

IV. PREVIOUS STANDARDS OR CRITERIA DEVELOPMENT PROJECTS

The quest for defining what constitutes quality environmental education is not new. The following represent efforts by the National Science Teachers Association and the American Society for Testing and Materials (ASTM) to develop guiding principles for environmental education. Also included is material prepared by the American Forum for Global Education suggesting conceptual guidelines for the development of national standards for international studies education.

A. **National Science Teachers Association, Criteria for Excellence in Environmental Education Criteria for Excellence, Revised Edition**

Effective environmental education depends on multidisciplinary instruction but has a strong science component. It involves minds-on direct contact with environments as well as vicarious experiences. The learner grows from awareness and understanding to concern and action.

Goal

To develop and practice creativity and critical thinking along with values analyses. Teachers and learners will search for alternative solutions to environmental issues and evaluate the ethical, social, ecological, and economic costs and benefits of alternatives.

Curriculum

1. Provides activities and information in which people interact with the environment.
2. Develops in the students the intellectual tools to effectively explore the world around them;
3. Directly involves students in investigating the world around them and their relationship to it.

Instruction

1. Fosters open minds and the generation and examination of alternatives;
2. Stimulates and fosters creativity and critical thinking;
3. Respects the social, intellectual, and developmental maturity of learners;
4. Links science with other areas of intellectual and emotional activity;
5. Provides opportunities for students to be involved in environmental activity at an appropriate level of challenge; hence, fosters a growing sense of confidence that groups and individuals can positively affect the environment;
6. Relates the components of the ecosystem to our health, well-being, and potential for development.

Evaluation

Effective programs and materials provide

1. Evaluation design based on stated goals, objectives, and outcomes;
2. Field testing of programs and materials in terms of stated goals and objectives;
3. Continuous modification and feedback.

Teachers

1. Distribute EE guidelines to colleagues;

2. Encourage colleagues to increase their environmental literacy;
3. Hold clearly stated goals and objectives for learner behavior;
4. Treat controversial issues fairly and honestly;
5. Teach people how to think, not what to think.

B. **ASTM, EE Curriculum Draft Standards, Curriculum Task Group (1991)**

These guidelines recommend that formal educational institutions and agencies develop, promote, and facilitate environmental education curricula that enhance environmental awareness and knowledge; as such the guidelines will:

Impart overall environmental awareness and knowledge.

Recognize and emphasize ecology as a critical cornerstone of all environmental education programs.

Communicate and apply major ecological concepts to an improved awareness and understanding of the environment (e.g..., humans as ecological variables, and extensive discussions and illustrations of different scales of time and space as they relate to function and development of any ecosystem).

Communicate and apply major social science concepts to an improved awareness and understanding of the environment.

Demonstrate the usefulness of ecological and social science concepts in understanding human dependance upon stable and productive ecological and social systems for survival.

These guidelines recommend that formal educational institutions and agencies develop, promote, and facilitate environmental curricula that demonstrate issue investigation, analysis, and action skills; as such, the guidelines will:

Identify a wide variety of environmental issues and problems and demonstrate the application of ecological and social science concepts in recognizing and interpreting these issues and problems.

Describe how human behavior, beliefs, values and cultural activities (e.g. religious, economic, political, social, and others) impact on the environment and relate to environmental issues and problems.

Recommend various issues investigation strategies using both primary and secondary sources of information (e.g. generating research questions; developing a survey; planning data-collection; organizing data into charts/tables/graphs; generating data-based conclusions; developing inferences and recommendations; and communicating research findings).

Identify various alternative solutions to environmental problems and predict the possible or probably ecological, social, political, legal, and economic

consequences of alternative solutions to these problems.

Demonstrate a strategy for the identification, evaluation, and modification of personal and group value positions and action strategies, relative to the environment.

Demonstrate strategies for the correction of environmental problems (e.g. persuasion, consumer action, political action, legal action, and eco-management).

Identify sources of scientific and social science information appropriate to the investigation and evaluation of environmental issues, problems, and solutions.

These guidelines recommend that formal educational institutions and agencies develop, promote, and facilitate environmental education curricula that demonstrate the following instructional methodologies:

GOAL ORIENTATION

A knowledge of education philosophy will be used to select, develop, and implement curricular programs and strategies to achieve both general educational and environmental education goals.

COORDINATION WITH ESTABLISHED LEVELS OF ENVIRONMENTAL LITERACY

Graded environmental education curricula will be developed to coordinate with the various levels of environmental literacy as detailed in Literacy Standards for Environmental Education (refer to documents produced by the Environmental Literacy Subcommittee: e.g., curricula for the nominally, functionally, and operationally literate.)

COORDINATION WITH CONVENTIONAL LEVELS OF INSTRUCTION

Environmental education curricula will be developed which are targeted toward several primary levels of instruction: teacher education, lower/upper elementary education, and secondary education. The curricula will be designed so that its facilitation and mode of presentation will be appropriate to the learning level toward which it is targeted.

CURRICULUM INFUSION

Environmental education curricula will be designed with open-ended components to allow for (a) ease of infusion into existing curricula, (b) opportunities for educators to create their own unique topic approaches and presentation formats, and (c) on-going modifications to reflect the dynamic, ever changing nature of environmental instruction.

COMPATIBILITY WITH ACCEPTED THEORIES OF TEACHING AND LEARNING

Environmental education curricula will be developed that utilize and reflect a wide diversity of instructional applications, as detailed in Teacher Education Standards

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for Environmental Education (e.g. contemporary theories and practices relating to education philosophy, learning behavior, teaching methodologies, evaluation, and development of curriculum materials).

SELECTION OF APPROPRIATE METHODOLOGIES/SITES

Environmental education curriculum will select and implement instructional methodologies and sites which are appropriate for desired cognitive, affective, and behavioral outcomes and for a variety of learner characteristics (e.g. outdoor education methods, affective education methods, simulation games and role playing, case study methods, community resource use, etc.)

EVALUATION

Environmental education curricula should be designed for ease of evaluation. The evaluation criteria should reflect elements typical of any conventional curriculum as well as evaluation components that may be unique to the scope of environmental education.

D. **Smith, A. (1994) Concept Paper on Developing National Standards for International Studies Education**

Global Issues and Topics

A. global environment, including biodiversity and species protection
B. global resources, the need for conservation, development of alternative energy sources, and sustainability
C. global trends in population and related issues such as urbanization, migration, growth and control, and population distribution
D. major economic realities and significant issues of international trade, development, aid and investment
E. world peace and security
F. international human rights and human values
G. hunger, food supply and distribution around the world
H. ethnic conflict, diversity and human commonality
I. significant differences in systems of government
J. the United Nations and other international and regional organizations
K. world cultures
L. global developments in science and technology

Culture Studies and Area Studies

America and the World

A. America's contemporary and historical connections with global issues and areas
B. understanding individuals' relationships and connections with global issues and other cultures
C. citizenship responsibilities

Excellence in Environmental Education –
Guidelines for Learning (K-12)
Reviewer Response Form

INTRODUCTION
a) Does the Introduction provide sufficient background? Yes ___ No ___
How can it be improved?

GRADES K-4

Theme #1 Questioning and Analysis Skills
Comments:

Theme #2 Knowledge of Environmental Processes and Systems
Comments:

(Don't forget to attach your suggestions from the boxes on pages 17 and 23)

Theme #3 Skills for Understanding and Addressing Environmental Issues
Comments:

Theme #4 Personal and Civic Responsibility
Comments:

GRADES 5-8

Theme #1 Questioning and Analysis Skills

Comments:

Theme #2 Knowledge of Environmental Processes and Systems

Comments:

(Don't forget to attach your suggestions from the boxes on pages 38 and 45)

Theme #3 Skills for Understanding and Addressing Environmental Issues
Comments:

Theme #4 Personal and Civic Responsibility
Comments:

GRADES 9-12

Theme #1 Questioning and Analysis Skills

Comments:

Theme #2 Knowledge of Environmental Processes and Systems

Comments:

(Don't forget to attach your suggestions from the boxes on pages 63 and 71)

Theme #3 Skills for Understanding and Addressing Environmental Issues
Comments:

Theme #4 Personal and Civic Responsibility
Comments:

Overall, do these Guidelines adequately reflect the core ingredients of quality environmental education? Yes ____ No ____ How can they be improved?

Other comments? Feel free to attach additional pages.

Name: _____ **Phone:** _____
Address: _____
_____

Please return your comments by **May 8, 1998** to: Bora Simmons, Northern Illinois University, PO Box 299 Oregon, IL 61061 (815) 732-4242 (fax)